

**BENEFIT-COST ANALYSIS/UNFUNDED  
MANDATES REFORM ACT ANALYSIS  
FOR PROPOSED RULEMAKING**

**REGULATING THE USE OF LOWER COLORADO  
RIVER WATER  
WITHOUT AN ENTITLEMENT**

**RIN1006-AA50**

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**Benefit-Cost Analysis/Unfunded Mandates Reform Act Analysis  
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**Benefit-Cost Analysis/Unfunded Mandates Reform Act Analysis  
Regulating the Use of Lower Colorado River Water Without an Entitlement  
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**Executive Summary**

Purpose of the Benefit-Cost Analysis

This analysis is required under Executive Order 12866 and the Unfunded Mandates Reform Act for regulatory actions.

Purpose of the Proposed Rule

The rule provides a framework for identifying and curtailing the use of mainstream Colorado River water in the Lower Colorado River Basin without an entitlement. An entitlement authorizes a person or entity to take water from the lower Colorado River for beneficial use. An entitlement to take lower Colorado River water exists in one of three forms:

- (a) A decreed right as described in the Consolidated Decree entered by the United States Supreme Court in Arizona v. California, 547 U.S. 150 (2006) (Supreme Court Decree);
- (b) A water delivery contract with the Secretary of the Interior (Secretary); or
- (c) A Secretarial Reservation of lower Colorado River water.

Any diversion or consumptive use of lower Colorado River water without an entitlement is unlawful.

The rule will:

- (a) Establish the methodology to be used by the Bureau of Reclamation (Reclamation) to determine if a well pumps water that is replaced with water drawn from the lower Colorado River;
- (b) Establish the criteria a water user must satisfy to demonstrate that his or her well does not pump water that is replaced with water drawn from the lower Colorado River; and
- (c) Establish a process for a water user to appeal a determination that a specific well pumps water that would be replaced by water drawn from the lower Colorado River.

The rule will inform unlawful users about the existence of various options from which they may choose to bring their use of Colorado River water in the Lower Basin into compliance with Federal law.

Summary of Findings

The objective of the benefit-cost analysis is to evaluate the net benefits associated with this proposed rule. The economic impacts of the rule were estimated over a 20-year period, from 2008 through 2027, based upon water use assumptions for operational wells and river pumps inventoried by the United States Geological Survey (USGS) throughout the Colorado River aquifer in the Lower Colorado River Basin.

### Identification of Incremental Benefits

The proposed rule is found to have broad public benefits; however, these benefits are difficult to quantify in monetary terms. The potential benefits of the rule are associated with enforcement of law and protection of entitlements which underlie the orderly distribution and utilization of Colorado River water supply by lawful entitlement holders. Colorado River water entitlement holders have the privilege of using Colorado River water in perpetuity assuming the water is put to beneficial use and the mainstream water supplies are available. The maintenance of a regime to protect entitlements is not costless. The benefits associated with a system of entitlements based on priority accrue broadly across all lawful users of water from the lower Colorado River. However, the incremental benefits associated with the proposed regulation cannot easily be monetized given the lack of information concerning any potential water user behavioral changes.

### Identification and Quantification of Incremental Costs

Annual water use assumptions were developed for irrigation, domestic, public supply, commercial, industrial, and other uses of Colorado River water via wells and river pumps in the Lower Basin. Through application of the water use assumptions and well inventory data, annual and one-time institutional and Federal costs associated with obtaining a Colorado River water entitlement or becoming a customer of a Colorado River water entitlement holder were estimated.

Institutional costs can be categorized as either one-time or annual. An example of a one-time cost is the application fee for organization or reorganization assessed by local regulatory commissions in California known as Local Area Formation Commissions (LAFCOs) which have jurisdiction over changes in water district boundaries or service areas. An example of an annual institutional cost is the annual assessment charged by Colorado River water entitlement holders such as a water district or the City of Needles, California which serves as the contracting agent for the Secretary of the Interior under the Lower Colorado Water Supply Project (LCWSP).

Federal costs are costs assessed by Reclamation. These costs can be categorized into two groups: annual administrative costs and miscellaneous costs which are assessed when a water user requests certain types of service. An annual administrative fee is assessed by Reclamation on all Colorado River water delivery contract holders. This fee is at least \$600 per year based upon the direct and indirect costs incurred to administer a water delivery contract. An example of a miscellaneous cost is the cost associated with Reclamation's review and approval of a change in district boundary or service area. Depending upon water district policy, such costs may or may not be passed on to individual water users.

The financial impact of this rule to the individual well or river pump owner will vary depending upon the following characteristics: (a) the state in which the water use occurs; (b) whether or not the well/river pump owner obtains a Colorado River water entitlement or becomes a customer of a Colorado River water entitlement holder; and (c) the amount of annual water use and the type of use to which the water is applied. Tables 9, 10, 11, 13, and 14 present estimates of the annual costs in 2007 dollars on a per acre-foot basis

for domestic, commercial, industrial, public supply, and agricultural water users. Tables 12 and 15 present estimates of one-time costs in 2007 dollars on a per well basis which may be incurred by water users to gain compliance with Federal law. Tables 16, 17, and 18 present estimates of annual costs, by state, for each year in the 20-year study period for the water uses covered in the benefit-cost analysis.

The net present value of the cost streams are provided at the bottom of the tables using real discount rates of 3 percent and 7 percent as required by the Office of Management and Budget (OMB) in Circular A-4, dated September 17, 2003, and Circular A-94, dated October 29, 1992. Table 19 summarizes institutional and Federal one-time and annual costs for different water use categories by state. Costs have been discounted over the 20-year study period under real discount rates of 3 percent and 7 percent. Under the real discount rate of 3 percent, the total estimated costs range from \$340,804 to \$5,375,118. Under the real discount rate of 7 percent, the total estimated costs range from \$256,313 to \$3,742,363. Reclamation estimates that the amount of water lost due to the use of Colorado River water in the Lower Basin without an entitlement outside of existing lower Colorado River water delivery service areas ranges between 9,000 and 15,000 acre-feet per year. On a per acre-foot basis, over a range of 9,000 acre-feet per year to 15,000 acre-feet per year, the total estimated cost ranges from \$22.72 to \$597.24 under a 3 percent discount rate and \$17.09 to \$415.82 under a 7 percent discount rate. The wide range of costs is mainly due to variation in annual assessments charged by water purveyors.

The benefit-cost analysis indicates that the proposed rule is not a significant rule from an economic perspective because the annual economic impact is estimated to be substantially less than \$100 million.

## **SECTION I**

### **POLICY RATIONALE**

## **Introduction**

The purpose of this analysis is to satisfy the requirements of Executive Order 12866 and the Unfunded Mandates Reform Act (UMRA). Both Executive Order 12866 and the UMRA require Federal agencies to undertake benefit-cost analysis for regulatory actions. The material presented below analyzes the benefits and costs of the regulatory action as well as its potential effects on state, local, and tribal governments. The benefits and costs are evaluated in comparison to the conditions that would be reasonably expected to exist absent this rulemaking.

## **Policy Rationale**

The United States Department of the Interior, Bureau of Reclamation (Reclamation), is proposing this rule to address and eliminate the use of Colorado River water in the lower Colorado River basin without an entitlement. Reclamation believes that development of this rule will help to ensure the long-term sustainability of the lower Colorado River and thus will protect the water rights of all Colorado River water entitlement holders. The rule will establish procedures that Reclamation will follow in making determinations of unlawful use of Colorado River water, including notice and administrative appeal procedures for those persons or entities whose use of Colorado River water is identified as an unlawful use.

Reclamation is required to ensure that all Colorado River water use in the Lower Basin is covered by an entitlement and correctly accounted for within each Lower Division State's apportionment. Each Lower Division State's apportionment of Colorado River water is legally defined to be a specific quantity of water.

The lower Colorado River is a resource that is characterized by high subtractability, meaning that one person's use of a resource reduces the availability of that resource for others. This fact leads Reclamation to conclude that this rulemaking is necessary and appropriate. Other reasons which support the development of this rule include: 1) each Lower Division State is fully utilizing its respective apportionment, and 2) the current prolonged drought in the Colorado River Basin which has reduced water stored in Colorado River reservoirs in recent years.

The Colorado River is a primary source of water for irrigation and municipal and industrial (M&I) uses in the Lower Basin within Arizona, California, and Nevada (the Lower Division States). Colorado River water is stored behind Hoover Dam, authorized by the Boulder Canyon Project Act of 1928 (BCPA), for delivery and beneficial use in the United States. In addition, water stored by Hoover Dam is released pursuant to the United States 1944 Treaty with Mexico which addresses the use of the Colorado, Rio Grande, and Tijuana Rivers.

## Legal Authority for the Proposed Rule

The Secretary of the Interior (Secretary) is responsible for managing the mainstream waters of the lower Colorado River pursuant to Federal law. The Secretary performs water master responsibilities consistent with a body of documents referred to as the “Law of the River.” The Law of the River is comprised of operating criteria, regulations, and administrative decisions included in Federal and state statutes, interstate compacts, court decisions and decrees, an international treaty, and water delivery contracts with the Secretary.

The initial apportionment of Colorado River water was determined by the Colorado River Compact of 1922 (Compact) which divided the Colorado River system into two sub-basins, the Upper Basin and the Lower Basin. The Upper Basin includes those parts of the states of Colorado, Utah, Wyoming, Arizona, and New Mexico within and from which waters drain naturally into the Colorado River above Lee Ferry, Arizona. The Lower Basin includes those parts of the states of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River system below Lee Ferry, Arizona. The Compact also divided the seven Basin States into the Upper Division and the Lower Division states. The Upper Division States are Wyoming, Utah, Colorado, and New Mexico. The Lower Division States are Arizona, California, and Nevada.

The Compact apportioned to the Lower Basin states and the Upper Basin states, in perpetuity, the exclusive beneficial consumptive use of 7.5 million acre-feet of water per year (maf<sup>y</sup>). In addition to this apportionment, Article III(b) of the Compact gives the Lower Basin states the right to increase their beneficial consumptive use by 1.0 maf<sup>y</sup> if the water supply of the Colorado River is determined to be sufficiently high to permit such an increase in Lower Basin consumptive use.

Lower Division State apportionments of Colorado River water were established by the United States Congress in the BCPA as follows: Arizona, 2.8 maf<sup>y</sup>; California, 4.4 maf<sup>y</sup>; and Nevada, 0.3 maf<sup>y</sup>, totaling 7.5 maf<sup>y</sup>, subject to annual increases or reductions pursuant to Secretarial determinations of shortage or surplus conditions. Colorado River water within Lower Division State apportionments is allocated to specific entities or individuals within each state. These allocations, known as “entitlements,” specify the quantity of water that may be used annually, the purpose for which the water may be used, and where the use may occur. To lawfully take water from the lower Colorado River, a person or entity must have an entitlement. An entitlement exists in one of three forms: (i) a decreed right as described in the Consolidated Decree entered by the United States Supreme Court in Arizona v. California, 547 U.S. 150 (2006) (Supreme Court Decree), (ii) a contract with the Secretary, or (iii) a Secretarial reservation of Colorado River water.

The BCPA requires any person in the United States using lower Colorado River water to have a contract for such water with the Secretary. The Regional Director of Reclamation’s Lower Colorado Region (Regional Director) enters into water delivery

contracts with water users in Arizona, California, and Nevada on behalf of the Secretary. A valid water delivery contract constitutes an authorization by the Secretary, or an entitlement, to divert and consume Colorado River water in the Lower Basin.

The Supreme Court Decree requires Reclamation to account for all mainstream Colorado River water use in the Lower Basin. Pursuant to this requirement, Reclamation prepares and maintains complete, detailed, and accurate records of all known diversions, return flow, and consumptive use of Colorado River water in the Lower Basin on an annual basis. These accounting records include all diversions and use of Colorado River water in Arizona, California, and Nevada, whether or not currently authorized by a water delivery contract or other form of entitlement. All reported Colorado River water use in a state, whether authorized by an entitlement or not, is required by the Supreme Court Decree to be accounted for against the amount of Colorado River water available in that state during that year.

#### Charges by the United States for the Use of Colorado River Water in the Lower Basin

Under the framework of the BCPA, Reclamation did not appropriate lower Colorado River water under state law. Under the BCPA, the United States is not authorized to impose charges for the use, storage, or delivery of Colorado River water in the Lower Basin. Water users are responsible for the payment of charges assessed by water districts for the diversion, conveyance, treatment, and delivery of Colorado River water. Unlawful water users who gain compliance with Federal law regarding lower Colorado River water use will not be charged by Reclamation for use, storage, and delivery of Colorado River water. However administrative costs incurred by Reclamation to negotiate and develop water delivery contracts and approve inclusions of land into district boundaries will be assessed to those who request such services from Reclamation. Such costs are discussed under the Federal Cost section of this analysis.

#### National Benefits of Regulatory Action

The Colorado River is uniquely and strategically important in the southwestern United States for water supply, hydropower production, recreation, fish and wildlife habitat, scenery, and history. Additionally, the United States has a delivery obligation to the United States of Mexico (Mexico) for certain waters of the Colorado River pursuant to the 1944 Treaty between the United States and Mexico. For the Colorado River to provide the above-mentioned benefits and amenities indefinitely, Colorado River water use must occur in a manner that is consistent with the established system of priorities and entitlements. Restrictions must be implemented to exclude users who do not possess an entitlement to Colorado River water.

#### Colorado River Water Supply and Demand

In 1996, for the first time ever, demand for Colorado River water in the Lower Division States exceeded the annual basic apportionment of 7.5 million acre-feet (maf) pursuant to Article II(B)(1) of the Supreme Court Decree. The period from 2000 through 2007 was

the driest 8-year period in the 100-year historical record of the Colorado River. From October 1, 1999, through September 30, 2007, storage in Colorado River reservoirs decreased from 55.8 maf (approximately 94 percent of capacity) to 32.1 maf (approximately 54 percent of capacity), and was as low as 29.7 maf (approximately 52 percent of capacity) in 2004.<sup>1</sup> In the future, low reservoir conditions may not be limited to drought periods because of anticipated future demands on Colorado River water supplies. Future Colorado River water demands are projected to increase the frequency and magnitude of drought and low reservoir conditions on the Colorado River.<sup>2</sup>

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<sup>1</sup> Bureau of Reclamation. 2007. Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead. Final Environmental Impact Statement.

<sup>2</sup> Bureau of Reclamation. 2007. Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead. Draft Environmental Impact Statement.

## **SECTION II**

### **BASELINE CONDITIONS**

## **Area of Study and Period of Analysis**

### Physical Setting of the Colorado River

The Colorado River originates in the mountains of central Colorado and flows southwesterly for approximately 1,440 miles through Colorado, Utah, and Arizona, and along the Arizona-Nevada and Arizona-California boundaries, after which it flows into Mexico and empties into the Gulf of California. The Colorado River drains from approximately 250,000 square miles from portions of seven states – Wyoming, Colorado, Utah, New Mexico, Nevada, Arizona, and California. The Colorado River basin is an area of approximately 900 miles in length from north to south and 300 to 500 miles wide from east to west - practically one-twelfth the area of the continental United States excluding Alaska. Over 170,000 square miles of the watershed are above Hoover Dam. The upper Colorado River basin, ranging in elevation from 3,000 to over 14,000 feet, supplies most of the water for the entire basin. Most of the discharge occurs from April through July when the winter snowpack melts. The lower Colorado River basin is arid with very little tributary runoff reaching the mainstream of the Colorado River except during occasional storms. The Lower Basin is largely dependent upon managed use of the Colorado River system to make its lands productive and inhabitable.

### Area of Direct Impact

The rule would have a direct impact upon the geographic area within the lower Colorado River basin beginning at Lee Ferry in the northern part of the Lower Basin and extending downstream to the Southerly International Boundary between the United States and Mexico. The area of direct impact extends laterally from the river corridor to the exterior boundaries of the Colorado River aquifer. Junior water users such as the Central Arizona Water Conservation District and the Metropolitan Water District of Southern California may be negatively impacted when the amount of reported Colorado River water use increases as unlawful users become compliant with Federal law. Assuming that these water users, over time, begin to report their use pursuant to this rule, less lower Colorado River water, known as “unused entitlement,” may be available for the junior users. In Arizona, approximately 10,000 acre-feet of Colorado River water within Arizona’s apportionment remains unallocated. Certain water users in Arizona, such as the Central Arizona Water Conservation District, have been able to take delivery of this unallocated Colorado River water in Arizona. Following implementation of this rule, the 10,000 acre-feet of Colorado River water may be allocated to those users in Arizona who are currently using Colorado River water without an entitlement. The 10,000 acre-feet of Colorado River water under Arizona’s apportionment which is unallocated is a part of the regulatory baseline because it is lawfully used by Arizona water users and its use is accounted for. Attachment 1 illustrates the geographic area covered by the proposed rule.

### Period of Analysis

The period of analysis for this study is 20 years, from 2008 through 2027. A 20-year period was selected due to uncertainty regarding future water supply conditions, how

incremental costs will change over a longer period, future demands for lower Colorado River water, and the length of the project life of the Lower Colorado Water Supply Project (LCWSP) due to uncertainty regarding future groundwater quality. Additionally, discounting significantly diminishes financial values as the period of analysis is extended.

## **The Nature of the Colorado River and Entitlements to Colorado River Water**

### Lower Colorado River – A Common-Pool Resource

The mainstream of the lower Colorado River and the Colorado River aquifer is best characterized as a common-pool resource. Common pool resources typically have characteristics of both private and public goods. The type of ownership, public or private, of a common pool resource also has implications for resource management.

A common pool resource is defined as follows:

*A common-pool resource, alternatively termed a common property resource, is a particular type of good consisting of a natural or human-made resource system, the size or characteristics of which makes it costly, but not impossible, to exclude potential beneficiaries from obtaining benefits from its use.<sup>3</sup> A common-pool resource also refers to a property regime that allows for some collective body to devise schemes to exclude others, thereby allowing the capture of future benefit streams to a collective set of users.<sup>4</sup>*

Examples of common-pool resources include lakes, rivers, irrigation systems, groundwater basins, fishing grounds, grazing areas, and forests. A pasture, for instance, allows a certain amount of grazing to occur each year without the core resource being harmed. In circumstances of excessive grazing however, the pasture may become more prone to erosion and eventually yield less forage annually to its users. With their core resource being vulnerable, common-pool resources are generally subject to the problems of congestion, overuse, pollution, and potential destruction unless limits on harvesting or use are devised and enforced.<sup>5</sup> Thus, unlike pure public goods, one's consumption of a common-pool resource rivals the consumption of another.

Beneficiaries of a common-pool resource may behave as if they have an exclusive property right and can use the resource as they wish. Each person who benefits from the common-pool resource, in an economically rational sense, exploits the common-pool

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<sup>3</sup> Elinor Ostrom, *Governing the Commons. The Evolution of Institutions for Collective Action* (New York, New York: Cambridge University Press, 1990).

<sup>4</sup> Nick Hanley, Jason F. Shogren, and Ben White, *Environmental Economics in Theory and Practice*, (New York, New York: Oxford University Press, 1997)

<sup>5</sup> Charlotte Hess and Elinor Ostrom, *Artifacts, Facilities, and Content: Information as a Common-pool Resource, Workshop in Political Theory and Policy Analysis*, Duke University School of Law, Durham, North Carolina, March 25, 2002.

resource to gain the maximum benefits from that resource without regard for how his or her use impacts others. The term “externality” refers to an economic concept asserting that inefficiencies result when costs incurred and benefits received by individuals involved in an economic transaction or activity do not incorporate *all* the costs and benefits to society.<sup>6</sup> If all the people gaining benefits from a common-pool resource act as if the resource is private property, the resource will be over-used because the resource users will not bear the full costs associated with their activities.<sup>7</sup> In effect, the economically rational actions of all who benefit from using a common-pool resource leads to an irrational result, which is, the over-use and under-protection of that resource. This problem can turn into a “tragedy of the commons” when every individual user of a commons receives the full marginal benefit of such use, but only a portion of the marginal cost.<sup>8</sup> From an economic perspective, management of a common-pool resource should attempt to maximize the net benefits flowing from the resource, which implies the establishment and enforcement of formal or informal limits on use.

Unlike privately owned goods, exclusion of unlawful users of a common-pool resource is often difficult and/or costly and necessitates cooperation between resource users and resource managers. A cooperative approach must be implemented to report, account for, and monitor resource use. The use of many common-pool resources, if managed carefully, can be sustainable for a long time.

#### Are Entitlements to Lower Colorado River Water Property Rights?

Water is a unique resource which is essential to all life. Quantities are never entirely certain; drought, precipitation, and even the practices of other users create ever-changing circumstances.<sup>9</sup> In legal systems built on English common law, surface water is viewed as a type of “public trust” resource, where the sovereign retains rights and responsibilities to protect the resource for the public. In the western United States, the public trust doctrine is embodied in provisions that give authority to the state to administer appropriative systems and ensure beneficial use of water resources.<sup>10</sup> Similarly, the Secretary retains supervisory control over the lower Colorado River through powers granted to him by the United States Congress in the BCPA. The Secretary’s authority as water master of the lower Colorado River prevents any party from using lower Colorado River water in a manner that is harmful to the public interest. Thus, administration of lower Colorado River water entitlements is guided by the concept of reasonable and beneficial use.

In the lower Colorado River basin, as in the western United States generally, water is viewed by entitlement holders as a form of private property. However, on the lower Colorado River, entitlement holders do not possess a right to lower Colorado River water

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<sup>6</sup> Terry L. Anderson and J. Bishop Grewell, “Property Rights Solutions for the Global Commons: Bottom-Up or Top-Down?,” *Duke Environmental Law and Policy Forum*, Vol. X, No. 2. (2000).

<sup>7</sup> *ibid.*

<sup>8</sup> *ibid.*

<sup>9</sup> Sandra B. Zellner and Jessica Harder, “Is Water Property?” *Water Current*, Volume 39, No. 2. (University of Nebraska: Lincoln Water Center, 2007)

<sup>10</sup> *ibid.*

that can be considered private property in the ordinary sense; entitlement holders have the privilege of using lower Colorado River water. For example, Colorado River water entitlement holders may not alienate (sell or lease) their entitlement or buy other entitlements without the Secretary's permission. Beneficiaries of Federal Reclamation projects must comply with Reclamation law. In the 1963 United States Supreme Court Decision in Arizona v. California (373 U.S. 546), the Court stated that, "Having undertaken this beneficial project, Congress, in several provisions of the [BCPA] Act, made it clear that no one should use mainstream waters save in strict compliance with the scheme set up by the Act. . .the Secretary's power must be construed to permit him, within the boundaries set down in the [BCPA] Act, to allocate and distribute the waters of the mainstream of the Colorado River."

## **Institutional Framework**

### The Law of the River

The Secretary is vested with the responsibility of managing the mainstream waters of the Lower Basin pursuant to applicable Federal law. The responsibility is carried out in a manner consistent with a body of documents referred to as the Law of the River. The Law of the River comprises numerous operating criteria, regulations, and administrative decisions included in Federal and state statutes, interstate compacts, court decisions and decrees, an international treaty, and contracts with the Secretary. Particularly notable among these documents are:

- 1) The Colorado River Compact of 1922 (Compact): Apportioned beneficial consumptive use of water between the upper basin and lower basin;
- 2) The Boulder Canyon Project Act of 1928 (BCPA): Authorized construction of Hoover Dam and the All-American Canal, required that water users in the Lower Basin have a contract with the Secretary, and established the responsibilities of the Secretary to direct, manage and coordinate the operation of Colorado River dams and related works in the Lower Basin;
- 3) The California Seven Party Water Agreement of 1931: Through regulations adopted by the Secretary, established the relative priorities of rights among major users of Colorado River water in California;
- 4) The 1944 Mexican Treaty (and subsequent minutes of the International Boundary and Water Commission): Provides for the quantity and quality of Colorado River water delivered to Mexico;
- 5) The Upper Colorado River Basin Compact of 1948: Apportioned the Upper Basin water supply among the upper basin states;

- 6) The Colorado River Storage Project Act of 1956 (CRSPA): Authorized a comprehensive water development plan for the Upper Basin that included the construction of Glen Canyon Dam and other facilities;
- 7) The 1963 United States Supreme Court Decision in *Arizona v. California*: Confirmed that the apportionment of the Lower Basin tributaries was reserved for the exclusive use of the states in which the tributaries are located; confirmed the Lower Basin mainstream apportionments of 4.4 mafy for use in California, 2.8 mafy for use in Arizona and 0.3 mafy for use in Nevada; provided water for Indian reservations and other Federal reservations in California, Arizona and Nevada; and confirmed the significant role of the Secretary in managing the mainstream Colorado River within the Lower Basin;
- 8) The 1964 United States Supreme Court Decree in *Arizona v. California*: Implemented the Court's 1963 decision; the Decree was supplemented over time after its adoption. The Supreme Court entered a Consolidated Decree in 2006 which incorporates all applicable provisions of the earlier-issued Decrees;
- 9) The Colorado River Basin Project Act of 1968: Authorized construction of a number of water development projects including the Central Arizona Project. It also required the Secretary to develop the Long Range Operating Criteria and issue an Annual Operating Plan for mainstream reservoirs;
- 10) The Colorado River Basin Salinity Control Act of 1974: Authorized multiple salinity control projects and provided a framework to improve and meet salinity standards for the Colorado River in the United States and Mexico; and
- 11) The Grand Canyon Protection Act of 1992: Addressed the protection of resources in Grand Canyon National Park and in Grand Canyon National Recreation Area, consistent with applicable Federal law.

Other documents which are generally considered as part of the Law of the River include, but are not limited to, those listed below. Other provisions of applicable Federal law, such as the National Environmental Policy Act of 1969, as amended, and the Endangered Species Act of 1973, as amended, provide a statutory overlay on certain actions taken by the Secretary.

Selected Documents Included in the Law of the River:

- The River and Harbor Act of March 3, 1899
- The Reclamation Act of June 17, 1902
- Reclamation of Indian Lands in Yuma, Colorado River and Pyramid Lake Indian Reservations Act of April 21, 1904
- Yuma Project authorized by the Secretary on May 10, 1904, pursuant to Section 4 of the Reclamation Act of June 17, 1902
- Warren Act of February 21, 1910
- Protection of Property Along the Colorado River Act of June 25, 1910
- Patents and Water-Right Certificates Acts of August 9, 1912 and August 26, 1912

- Yuma Auxiliary Project Act of January 25, 1917
- Availability of Money for Yuma Auxiliary Project Act of February 11, 1918
- Sale of Water for Miscellaneous Purposes Act of February 25, 1920
- Federal Power Act of June 10, 1920
- The Colorado River Compact of November 24, 1922
- The Colorado River Front Work and Levee System Acts of March 3, 1925 and January 21, 1927-June 28, 1946
- The Boulder Canyon Project Act of December 21, 1928
- The California Limitation Act of March 4, 1929
- The California Seven Party Agreement of August 18, 1931
- The Parker and Grand Coulee Dams Authorization of August 30, 1935
- The Parker Dam Power Project Appropriation Act of May 2, 1939
- The Reclamation Project Act of August 4, 1939
- The Boulder Canyon Project Adjustment Act of July 19, 1940
- The Flood Control Act of December 22, 1944
- Treaty between the United States and Mexico Relating to the Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande of February 3, 1944
- The Colorado River Storage Project Act of April 11, 1956
- Water Supply Act of July 3, 1958
- Boulder City Act of September 2, 1958
- Report of the Special Master, Simon H. Rifkind, *Arizona v. California*, et. al., December 5, 1960
- The Consolidated Decree entered by the United States Supreme Court in the case of *Arizona v. California*, 547 U.S. 150 (2006)
- International Flood Control Measures, Lower Colorado River Act of August 10, 1964
- Southern Nevada (Robert B. Griffith) Water Project Act of October 22, 1965
- The Colorado River Basin Project Act of September 30, 1968
- Criteria for the Coordinated Long Range Operation of Colorado River Reservoirs, June 8, 1970
- Supplemental Irrigation Facilities, Yuma Division Act of September 25, 1970
- 43 C.F.R. Part 417 Lower Basin Water Conservation Measures, September 7, 1972
- Minute 218, March 22, 1965; Minute 241, July 14, 1972, (replaced 218); and Minute 242, August 30, 1973, (replaced 241) of the International Boundary and Water Commission
- The Colorado River Basin Salinity Control Act of June 24, 1974
- Hoover Power Plant Act of August 17, 1984
- The Numerous Colorado River Water Delivery and Project Repayment Contracts with the States of Arizona and Nevada, cities, water districts and individuals
- Hoover and Parker-Davis Power Marketing Contracts
- Reclamation States Emergency Drought Relief Act of 1991
- Grand Canyon Protection Act of October 30, 1992

- Operation of Glen Canyon Dam, Record of Decision (1996)
- Interim Surplus Guidelines Record of Decision, January 17, 2001 (66 Fed. Reg. 7772).
- Gila Project Act of July 30, 1947
- The Upper Colorado River Basin Compact of October 11, 1948
- Consolidated Parker Dam Power Project and Davis Dam Project Act of May 28, 1954
- Palo Verde Diversion Dam Act of August 31, 1954
- Change Boundaries, Yuma Auxiliary Project Act of February 15, 1956
- Interim 602(a) Storage Guidelines, May 19, 2004 (69 Fed. Reg. 28945)
- Colorado River Water Delivery Agreement of October 10, 2003 (69 Fed. Reg. 12202)
- Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead, Record of Decision, December 13, 2007.

### Lower Colorado River Water Entitlements and Primary Users

All mainstream Colorado River water apportioned to the Lower Basin, except for approximately 10,000 acre-feet within Arizona's apportionment, has been allocated to specific entities. Except for certain Federal establishments, mainstream water is placed under water delivery contracts with the Secretary for irrigation, domestic, and municipal and industrial use in perpetuity. The types of entities holding contracts with the Secretary include irrigation districts, water districts, municipalities, Indian tribes, public institutions, private water companies, and individuals. Allocation of Colorado River water to Mexico is governed by the 1944 Treaty with Mexico which apportions 1,500,000 acre-feet to Mexico annually.

The primary Colorado River water users and purveyors holding entitlements to at least 50,000 acre-feet per year in Lower Division states include the following:

- Arizona
  - Cocopah Indian Reservation
  - Colorado River Indian Reservation
  - Fort Mojave Indian Reservation
  - Fort Yuma Indian Reservation
  - Central Arizona Water Conservation District
  - Yuma County Water Users' Association
  - Wellton-Mohawk Irrigation and Drainage District
  - Yuma Irrigation District
  - Yuma Mesa Irrigation and Drainage District
  - North Gila Valley Irrigation District
  - City of Yuma
- California
  - Chemehuevi Indian Reservation
  - Fort Yuma Indian Reservation
  - Colorado River Indian Reservation

- Fort Mojave Indian Reservation
  - Metropolitan Water District of Southern California
  - Imperial Irrigation District
  - Coachella Valley Water District
  - Palo Verde Irrigation District
  - Bard Water District
- Nevada
    - Fort Mojave Indian Reservation
    - Southern Nevada Water Authority

### **Evaluation of Alternatives to Rulemaking**

The alternative to rulemaking is to take no action. Reclamation believes that no action is undesirable because:

1. Each Lower Division State is fully utilizing its respective apportionment;
2. The current prolonged drought in the Colorado River Basin has reduced the volume of water stored in Colorado River reservoirs;
3. Unlawful use of Colorado River water in the Lower Basin may escalate; and
4. Unlawful use of Colorado River water harms entitlement holders because unlawful use contributes to overuse of the resource.

The Secretary is authorized to issue regulations identifying the circumstances in which the Secretary will require a contract for the use of lower Colorado River water. Section 5 of the BCPA authorizes the Secretary to contract for the storage and delivery of Colorado River water “under such general regulations as he may prescribe.” Section 10 of the Reclamation Act of 1902 also authorizes the Secretary to issue regulations to put the statute into effect.

### **Inventory of Wells and River Pumps Along the Lower Colorado River and Adjacent Areas in Arizona, California, and Nevada**

At the request of Reclamation, the United States Geological Survey (USGS) is conducting an inventory of all wells and river pumps along the lower Colorado River and in adjacent hydraulically connected valleys in the Lower Division States.<sup>11</sup> Wells and river pumps within the scope of this rule are those that pump water that originates from the Colorado River or pump water that may be replaced in the underlying aquifer by Colorado River water. A summary of the USGS well inventory and river pump data used for this analysis are provided in the Appendix as Attachment 2. The inventory provides Reclamation with an accurate record of the locations of wells and river pumps, type of

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<sup>11</sup> River pumps either divert surface water for use directly from the Colorado River or from a structure, canal, or drainage ditch that is connected to the Colorado River. In the well inventory, any pump that is placed on a well is not designated as a river pump.

water use, and ownership. This information helps Reclamation determine whether or not a well pumps water that originated from the Colorado River or is replaced by water from the Colorado River. Reclamation is comparing information collected from the inventory with a list of water entitlements to ensure compliance with BCPA and the Supreme Court Decree.

To perform the inventory, USGS staff contacts the owner or operator of the well or river pump in person or by phone to ask permission to access the property to inventory any wells and river pumps. USGS staff does not access private property without permission.

### River Aquifer and Accounting Surface

The methodology used to determine the status of a well has been developed by the USGS.<sup>12</sup> This methodology identifies a river aquifer and a theoretical accounting surface within the river aquifer in order to identify wells that yield water that originated from the Colorado River or that yield water that will be replaced by Colorado River water.

#### *River Aquifer*

Colorado River water is stored in surface reservoirs and in an aquifer of permeable sediments and sedimentary rocks that fill the structural basins of the lower Colorado River valley and adjacent tributary valleys. Geophysical gravity studies, well logs, and previous hydrologic and geologic studies provided data on the extent and thickness of the sediments and sedimentary rocks. The total thickness ranges from zero to more than 5,000 feet. The subsurface limits of the river aquifer are the nearly impermeable bedrock of the bottom and sides of the basin. Most of the Colorado River water in the aquifer originated from the mainstream because of the hydraulic connection between the river and the aquifer and overbank flow prior to dam construction. Precipitation in surrounding mountains and inflow from tributary valleys contribute some water to the aquifer. The water table in the river aquifer extends from the Colorado River, beneath the floodplain, and beneath the alluvial slopes until it is intercepted by bedrock.

#### *Accounting Surface*

The term “accounting surface” is defined as the elevation and slope of the unconfined static water table in the river aquifer outside the floodplain and the reservoirs of the lower Colorado River that would exist if the lower Colorado River were the only source of water to the river aquifer. The accounting surface extends outward from the edges of the floodplain or a reservoir to the subsurface boundary of the river aquifer from the mouth of the Grand Canyon to just north of the Southerly International Boundary between the

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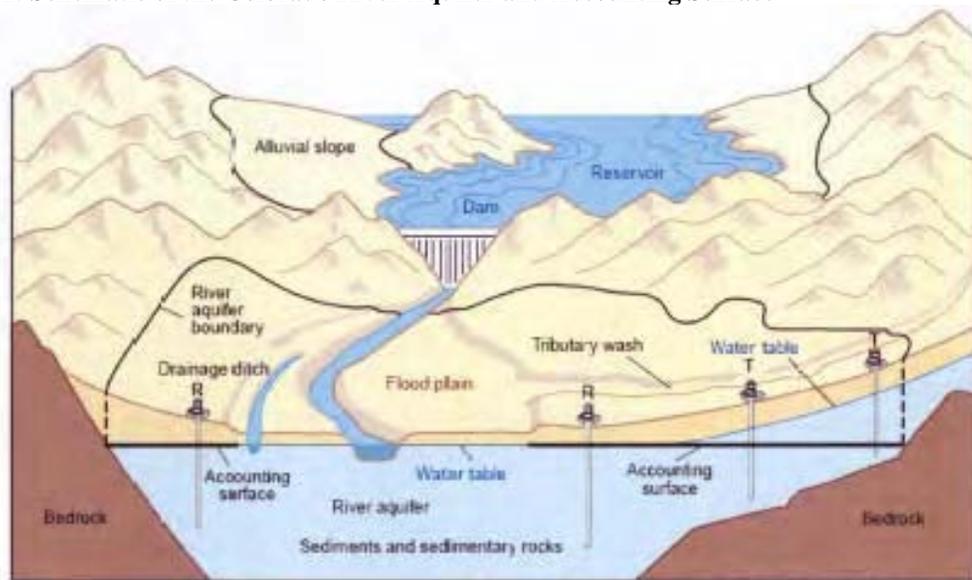
<sup>12</sup> R. P. Wilson and S. J. Owen-Joyce, “Method to Identify Wells that Yield Water that will be Replaced by Colorado River Water in Arizona, California, Nevada, and Utah,” *Water-Resources Investigations Report 94-4005*, (1994) [Lake Mead to Laguna Dam] and S. J. Owen-Joyce, R. P. Wilson, M. C. Carpenter, and J. B. Fink, “Method to Identify Wells that Yield Water that will be Replaced by Water from the Colorado River Downstream from Laguna Dam in Arizona and California,” *Water Investigations Report 00-4085*, (2000) [Laguna Dam to Mexico].

United States and Mexico.<sup>13</sup> Use of an accounting surface provides a uniform criterion based on hydrologic principles for all users pumping water from wells.

Wells that tap the river aquifer outside of the floodplain with a static (nonpumping) water level indistinguishable from or below the accounting surface are presumed to yield water that originated from the Colorado River or will be replaced by water drawn from the Colorado River. Wells with static water level above the accounting surface are presumed to yield water that originated from precipitation and inflow from tributary valleys.

The accounting surface was generated by using river profiles of the Colorado River and water-level elevations of the reservoirs, lakes, marshes, wetlands, and drainage ditches. River profiles were computed for the highest median monthly projected discharge required to meet annual downstream requirements of 7.5 maf of consumptive use by the Lower Division States plus an annual delivery to Mexico of 1.5 maf. Near reservoirs, the elevation of the accounting surface is defined by the annual high water-surface elevation used to operate the reservoir under normal flow conditions.<sup>14</sup> Figure 1 is a conceptual diagram showing the relationships between the Colorado River aquifer, the accounting surface, the floodplain, tributary inflow, the Colorado River, surrounding bedrock and wells drilled within the Colorado River aquifer.

**Figure 1: Schematic of the Colorado River Aquifer and Accounting Surface**



**EXPLANATION**

Well—The symbol "R" denotes a well that has a static water-level elevation equal to or below the accounting surface and is presumed to yield water that will be replaced by water from the river. The symbol "T" denotes a well that has a static water-level elevation above the accounting surface and is presumed to yield water that will be replaced by precipitation and inflow from tributary valleys.

Modified from Wilson and Owen-Joyce (1994)

<sup>13</sup> In the Yuma, Arizona accounting area the use of the accounting surface is superseded as determined by Reclamation.

<sup>14</sup> The technical discussion for this section came from, Richard P. Wilson, and S. J. Owen-Joyce., "Determining the Source of Water Pumped from Wells Along the lower Colorado River." *USGS open-File Report 93-405*, (1993).

## **SECTION III**

### **BENEFIT-COST ANALYSIS**

## Evaluating Potential Benefits and Costs for Rulemaking

An integral part of rulemaking is evaluating the potential changes in the stream of benefits and costs which would occur if the rule is promulgated as compared to the stream of benefits and costs that would be expected to accrue if the regulation were not promulgated. Future benefits and costs which may occur due to the proposed regulation are referred to as incremental benefits and costs. Future benefits and costs that would occur even if the regulation is not promulgated are effectively part of the existing regulatory baseline and are excluded from this analysis.

This rule may potentially affect individual irrigators, water districts, households, municipalities, industries, the state governments of Arizona, California, and Nevada, the Federal government, and Tribal entities. Reclamation will estimate and evaluate economic impacts to state, Federal, local, and private entities and individuals using traditional benefit-cost analysis methodology. This approach attempts to identify and estimate the magnitude of any changes resulting from the regulation and value the changes in dollar terms. The baseline, in terms of Colorado River water use, will essentially be unchanged after implementation of the rule. Changes in the level of Colorado River water use will not occur because the rule will educate unlawful water users about how to comply with Federal law. The objective of the rule is to bring unlawful use into compliance with existing law rather than to discontinue water supply to unlawful users. Lawful water use will not be impacted by the rule.

### Discount Rates

The discount rates for this regulatory action were obtained from United States Office of Management and Budget (OMB) Circular A-94, dated October 29, 1992, and OMB Circular A-4, dated September 17, 2003. Both OMB Circulars require that benefit-cost analyses completed for regulatory actions show results under two discount rate scenarios. Using two discount rates illustrates how costs and benefits may change (sensitivity analysis) under different discount rate assumptions. The sensitivity analysis portion of this study was completed by choosing real discount rates at 3 percent and 7 percent. Three percent is used because 3 percent is recognized as the social discount rate or the rate at which society discounts future consumption flows to their present value. A discount rate of 7 percent is used, as required by OMB, because it is an estimate of the average before-tax rate of return to private capital in the United States economy.<sup>15</sup> In terms of a natural resource analysis, the 7 percent discount rate gives more weight to current consumption than future consumption; the 3 percent discount rate leaves more opportunities for consumption by future generations.

When a benefit-cost ratio analysis is used, the selection criterion is to accept all the independent projects with a benefit-cost ratio of 1.0 or greater. Benefit-cost analyses

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<sup>15</sup> United States Office of Management and Budget. OMB Circular A-4: Regulatory Analysis. September 17, 2003. Page 33.

provide a “go or no-go” type of decision that can be consistently applied across multiple projects or alternatives.

## **Analytical Approach**

In the benefit-cost analysis the potential incremental benefits are examined qualitatively for reasons described in the section below. The water use assumptions for types of use drive the computation of estimated incremental costs. The estimated incremental nominal and discounted costs are identified as to state, type of water use, timing of occurrence, distribution, and magnitude on a unit cost per acre-foot and total cost basis and are distributed over the estimated range of annual unlawful use of lower Colorado River water.

Uncertainty exists regarding cost and the extent of unlawful water use. Through an informal inquiry with 12 water districts in the Lower Division States, we obtained information about costs that unlawful users may face to legitimize their water use. We used this information to develop lower and upper bounds for estimated cost by state and type of water use. Generally, annual costs are held constant over the study period because we do not know how costs will change over the study period. Obtaining additional more detailed cost information was not practical given the resources available to undertake this analysis.

The annual amount of unlawful water use is difficult to gage because the amount of use outside of entitlement holders’ service areas varies and also because some unlawful use occurs within geographic areas, such as contract service areas or water district boundaries, which are covered by a lower Colorado River water entitlement. These unlawful users are located within an entitlement holder’s service area but do not report their water use to the entitlement holder. Subsequently this water use is not reported by the entitlement holder to Reclamation. Reclamation lacks data on the extent of water use within entitlement holders’ service areas which goes unreported. However, Reclamation is aware that the amount of unreported use is greater than 0 acre-feet per year. To avoid underestimating potential incremental costs faced by unlawful users to legitimize their lower Colorado River water use, key assumptions were made to include water users located within service areas or water district boundaries whose use is unreported within the cost analysis. In addition to distributing estimated incremental compliance costs to wells located outside of entitlement holders’ service areas, for illustrative purposes, estimated incremental compliance costs were distributed to 10 percent of wells and/or river pumps located within entitlement holders’ service areas for certain types of water uses. These assumptions used in this analysis reflect Reclamation’s best professional judgment.

<b>Key Assumptions</b>			
<b>Type of Water Use</b>	<b>Distribution of Annual Costs to Water Users Within Entitlement Holders' Service Area</b>	<b>Percentage of Wells to which Annual Costs are Distributed</b>	<b>Percentage of Pumps to which Annual Costs are Distributed</b>
Domestic (Residential)	Yes	10	10
Industrial, Commercial, Public Supply, Other	No	0	0
Agricultural	Yes	0	10

### **Identification of Benefits**

The Boulder Canyon Project and other projects on the lower Colorado River were developed by the United States to enhance the natural water supply of the lower Colorado River and to permit the allocation of the water supply to foster economic development within the lower Colorado River basin. The development of water projects on the lower Colorado River, like private and public water projects developed elsewhere, require the establishment and implementation of a legal framework that recognizes existing water rights, creates a process for establishing additional water rights, implements a priority ordering system for all existing and future water rights, and allows for transferability of water rights as societal needs and demands for lower Colorado River water change. The development of large public water projects on the lower Colorado River and the implementation of legal systems to oversee and manage development and use of the resulting water supplies are largely responsible for the economic productivity of the lower Colorado River basin. Such broad public welfare gains are difficult to quantify. Similarly, the benefits resulting from implementation of the rule which contribute to the broad public welfare aspects of the lower Colorado River resource and its projects are difficult to quantify.

Identified below are categories of benefits which would be expected to result from implementation of the rule. Generally the benefits are associated with enforcement of law and regulations which provide for the orderly distribution and utilization of lower Colorado River water by entitlement holders in the lower basin. Protection of lower Colorado River water entitlements and proper accounting of lower Colorado River water use provide important regional and national benefits. Currently, the Colorado River supplies water for approximately 1.5 million acres of irrigated land and domestic supplies for more than 20 million people in the Lower Basin.

One important category of benefits associated with the rule is the provision of information to both water users and the public. In concept, additional information can lead to tangible benefits. Given data limitations, quantifying the value of these benefits is not possible. The information benefits include the following:

1. The rule will make the river aquifer/accounting surface methodology to be used by Reclamation to determine if a well pumps water that is replaced with water drawn from the lower Colorado River more transparent; and
2. The rule will provide more accurate information regarding the boundaries of the lower Colorado River aquifer, including the floodplain and accounting surface within the river aquifer, using methodology that meets high scientific standards.

The proposed rule will also provide benefits in terms of clarifying and making more transparent the institutional relationships associated with managing the Lower Colorado. These include the following:

1. The rule will clarify requirements under Colorado River law relative to the diversion and use of Colorado River water;
2. The rule will establish the criteria a water user must satisfy to demonstrate that his or her well does not pump water that would be replaced by water drawn from the lower Colorado River; and
3. The rule will clarify the administrative process associated with demonstrating that a well does or does not pump water that would be replaced by lower Colorado River water as well as the process for appealing a determination that a specific well pumps water that would be replaced by water drawn from the lower Colorado River.

Benefits are also associated with strengthening the ability of the Secretary to fulfill his management responsibilities:

1. The rule enables the Secretary to properly account for consumptive use of lower Colorado River water in accordance with the Supreme Court Decree. Proper accounting of consumptive use of lower Colorado River water is critical for planning, management, and operations of the resource and the infrastructure which stores and delivers lower Colorado River water for public benefit and permits the transferability of water rights; and
2. The rule will contribute to the long-term sustainability of the lower Colorado River through effective monitoring and data verification.

### Stock and Flow Values

The surface storage reservoirs on the mainstream and the Colorado River aquifer embody the stock variable of the lower Colorado River. Approximately four years of flow can be stored for future use in upper and lower Colorado River reservoirs. Current drought conditions highlight the importance of the stock variable of the water supply. Unlawful users who have wells drawing lower Colorado River water from the alluvial aquifer are

utilizing the stock resource which had been naturally converted over a long period of time from the flow resource. Water which is added to the lower Colorado River due to precipitation becomes the flow variable. The flow variable was apportioned to the upper and lower Colorado River basins by the Colorado River Compact of 1922. In 1922, prior to the construction of dams and storage reservoirs on the mainstream, the stock variable was relatively small and impossible to quantify since all the storage was held in the alluvial aquifer. As current storage volumes decrease, appropriate utilization of the flow variable of the lower Colorado River becomes more critical. The stock and flow variables are not substitutable but are complementary.

The rule will regulate use to facilitate Reclamation's management of existing flow and stock characteristics of the lower Colorado River. Public benefits resulting from improved stewardship and regulation of users are estimated to be large but unquantifiable because identification of the benefit values and to whom or to what purposes the benefit values accrue is difficult. Benefits derived from lower Colorado River water include consumptive and non-consumptive uses by humans, and "ecosystem functions served by water, such as dilution of wastes, channel maintenance, and enhancement of fish habitat."<sup>16</sup> "Non-use" or "passive use" values, which are based on the knowledge that something exists ("existence" value) and that it will be there for others to use ("bequest" value),<sup>17</sup> may be significant on the lower Colorado River due to its historical importance and the diversity of species it supports. The rule, which will enable improved management of depletions of the lower Colorado River, will support these values in perpetuity.

The rule will not change current patterns of consumptive or non-consumptive use of lower Colorado River water. The rule aims to inform unlawful users about obtaining compliance with Colorado River law to manage and account for their use under the law rather than to deprive them of access to Colorado River water. Economic value derived from consumptive and non-consumptive use of lower Colorado River water without the rule and with the rule will be similar. Only as a last resort will Reclamation, in concert with the United States Department of Justice, seek Federal court orders against unlawful lower Colorado River water users who refuse to comply with Federal law.

## **Identification and Quantification of Compliance Costs**

Lower Colorado River water users who do not have an entitlement may incur costs to bring their lower Colorado River water use into compliance with Federal law. The magnitude of the costs unlawful users may incur will vary depending upon the state in which a well or river pump is located, the manner in which a water user chooses to acquire an entitlement if necessary, whether or not the well or river pump is within the boundaries of a lower Colorado River water entitlement holder's service area, and the fees assessed by the entitlement holder upon its customers.

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<sup>16</sup> Thomas C. Brown, *The Marginal Economic Value of Streamflow From National Forests*, Discussion Paper DP-04-1, RMRS-4851 (Fort Collins, Colorado: United States Forest Service), December 28, 2004.

<sup>17</sup> *ibid.*

### The State in which a Well or River Pump is Located

Well and river pump users in Arizona who are not located within an entitlement holder's service area may be able to acquire a lower Colorado River water entitlement through a contract with the Secretary or by being included under a water delivery contract between the Arizona Department of Water Resources and the Secretary. The costs associated with these two contract options are discussed under the Federal Cost section of this analysis. In California, unlawful domestic users who are not located within an entitlement holder's service area may enter into a LCWSP water delivery subcontract with the City of Needles, California. LCWSP subcontractors are required to pay the initial and annual fees charged by the City of Needles. Owners of wells or river pumps in Nevada will be required to comply with Southern Nevada Water Authority or Big Bend Water District policies.

### Whether or not a Well or River Pump is Located within an Entitlement Holder's Service Area

In Arizona and California, if a well or river pump is not located within an entitlement holder's service area, it may be close enough to an entitlement holder's service area so that inclusion of a well or river pump by modification of the district boundary or service area boundary is possible. If an entitlement holder agrees to modify its district boundary or service area boundary to include a well or river pump, the owner will be required to pay for the cost incurred by Reclamation to review and approve the inclusion. The entitlement holder may or may not pass on other costs, if any, to the well or river pump owner. Once a well or river pump owner becomes a customer of an entitlement holder, the owner may be required to pay periodic fees assessed by the entitlement holder. These costs are discussed in the Institutional Cost section of this analysis.

If a well or river pump in Arizona, California, and Nevada is located within an entitlement holder's service area, lower Colorado River water use should be reported to the entitlement holder on a periodic basis as determined by the entitlement holder. Use of lower Colorado River water by the well or river pump owner will be accounted for by the entitlement holder as a part of all such uses within its service area. The entitlement holder will report the total use of lower Colorado River water occurring within its service area under its entitlement to Reclamation. Reclamation will account for lower Colorado River water use reported by the entitlement holder against the entitlement holder's entitlement on an annual basis.

## **General Water Use Assumptions**

The water use assumptions used in this analysis and applied to the wells and river pumps inventoried in Arizona, California, and Nevada by the USGS cover agricultural irrigation and nonagricultural uses. The water use assumptions utilized in this benefit-cost analysis are based on an unpublished, in-house analysis performed by Reclamation staff in the Lower Colorado Region in 2005. The analysis was performed to understand water use by

wells identified by the USGS in the well inventory which are located outside of service area boundaries.<sup>18</sup> The analysis is provided in Attachment 3.

### Agricultural Water Use Assumptions (Wells)

Information about irrigated acres and the resultant water use was extracted from a 2005 Reclamation in-house analysis. This analysis identified 227 fields outside of service area boundaries in California that produced agricultural products from well water sources and included information for an entire year's production. Of the 227 fields identified, 175 produced one or more crops during the year. For land that was double-cropped, this analysis was able to ascertain the types of crops that were grown on the land at different times during the year. The 175 fields producing either a single crop or multiple crops on the same acre covered 1,806 acres in total and their estimated consumptive use of irrigation water was 6,700 acre-feet. The consumptive use was estimated by calculating the evapotranspiration of the crops which were identified in the analysis. Assuming an irrigation efficiency of 67 percent, the amount of water pumped to serve the 175 fields was estimated to be 10,000 acre-feet. Twenty-one wells served the 1,806 acres, for an average of 86 irrigated acres per well. Each well was assumed to pump an average of 476 acre-feet of water during the year which equates to an average of 5.54 acre-feet per acre. The associated consumptive use was an average 3.71 acre-feet per acre.

Crops included in the Reclamation in-house analysis were: alfalfa hay, bermuda grass hay, sudan grass hay, cotton, vegetables, spring and fall melons, early and late lettuce, dates, and small grains.

### Domestic Water Use Assumptions (Wells)

In the USGS well inventory, the Domestic Use category includes stock supply, residential use, institutional use, fire protection, air conditioning, recreation, aquaculture, mining, public supply, and industrial and commercial use. In this analysis, public supply and industrial and commercial water use are not grouped with the other uses within the Domestic Use category. Public supply and commercial and industrial uses will be discussed separately. The term, "domestic use" will apply to all uses listed above excluding public supply and commercial and industrial use.

Domestic (Residential) Water Use - Estimates of consumptive use and total water use for domestic wells were obtained from the 2005 in-house study conducted in Boulder City, Nevada. The study was able to isolate domestic water use from Boulder City's total water use; it found that the domestic per capita consumptive water use was 0.14 acre-feet (45,620 gallons) of water per year. Each household was assumed to have 2 full-time occupants, thus the total domestic water use (consumptive basis) is 91,240 gallons, or 0.28 acre-feet per household per year. After accounting for pumping and delivery efficiencies (assumed to be 98 percent), the total amount of water pumped for each

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<sup>18</sup> The analysis was performed in Arizona and California. In Arizona, all fields initially identified by Reclamation as being located outside of service area boundaries were found to be within service area boundaries upon review by the Arizona Department of Water Resources.

household is estimated at 0.29 acre-feet per household, or 94,498 gallons per year. The total use rate of 0.29 acre-feet per year is assumed for all other uses under the domestic use category.<sup>19</sup>

**Industrial or Commercial Water Use Assumptions** - In this benefit-cost analysis, industrial and commercial wells are assumed to have a consumptive use value of one acre-foot per well. A pumping and delivery efficiency of 50 percent is assumed because we do not know the nature of the industrial and commercial uses. Thus, the total estimated amount pumped per industrial/commercial well is 2 acre-feet per well.

**Public Supply Water Use Assumptions** - The consumptive use rate (0.28 acre-feet) and total use rate (0.29 acre-feet) for a public supply well is the same as for a residential well. However, each public supply well is assumed to serve 10 households, so the total use per public supply well is 10 times that of a residential well, or 2.9 acre-feet per well per year.

### **River Pumps and Wells Included in this Benefit-Cost Analysis**

The number and type of use for wells and river pumps in Arizona, California, and Nevada utilized in this analysis were obtained from the on-going well inventory by the USGS. River pump and well inventory summary data are provided in Attachment 2. Tables 1 and 2 are summary tables for river pumps and wells by state and type of use.

**Table 1: River Pumps Summary**

<b>Pump Type</b>	<b>Arizona</b>	<b>California</b>	<b>Nevada</b>	<b>Total</b>
	<b># Pumps</b>	<b># Pumps</b>	<b># Pumps</b>	<b># Pumps</b>
<b>Domestic</b>	69	122	0	191
<b>Irrigation</b>	44	25	0	69
<b>Other</b>	0	0	0	0
<b>Total</b>	113	147	0	260

Source: Bureau of Reclamation, 2007

<sup>19</sup> Derived per-capita consumptive use factors for Boulder City are used in this analysis because Boulder City derives all municipal supplies from diversion from the surface stream of the Colorado River (no private wells and all domestic water returns to a sewer system (no septic tanks). The 1989 to 1992 average consumptive use for January was multiplied by 12 to approximate an annual value with minimal landscape irrigation. Delivery for municipal landscape irrigation was removed.

**Table 2: Well Summary**

<b>Well Type</b>	<b>Arizona</b>	<b>California</b>	<b>Nevada</b>	<b>Total</b>
<b>Domestic</b>	<b># of Wells</b>	<b># of Wells</b>	<b># of Wells</b>	<b># of Wells</b>
Stock Supply	17	4	0	21
Residential	1,117	1,070	0	2187
Institutional	7	7	0	14
Fire Protection	3	4	0	7
Air Conditioning	3	0	0	3
Recreation	2	0	0	2
Mining	8	3	0	11
<b>Subtotal</b>	<b>1157</b>	<b>1088</b>	<b>0</b>	<b>2245</b>
Public Supply	139	101	5	245
Industrial	24	29	0	53
Commercial	41	21	0	62
<b>Total Domestic<sup>20</sup></b>	<b>1,361</b>	<b>1,239</b>	<b>5</b>	<b>2,605</b>
<b>Irrigation</b>	<b>238</b>	<b>78</b>	<b>1</b>	<b>317</b>
<b>Other<sup>21</sup></b>	<b>8</b>	<b>2</b>	<b>0</b>	<b>10</b>
<b>Unclassified</b>	<b>17</b>	<b>4</b>	<b>5</b>	<b>26</b>
<b>Unused</b>	<b>20</b>	<b>7</b>	<b>0</b>	<b>27</b>
<b>Total Wells</b>	<b>1,644</b>	<b>1,330</b>	<b>11</b>	<b>2,985</b>

Source: Bureau of Reclamation, 2007

### Agricultural Wells and River Pumps and Annual Water Use Assumptions

Arizona - The USGS inventoried 238 irrigation wells in Arizona. The USGS identified two irrigation wells located outside of service area boundaries. However, Reclamation, at the request of the irrigation district, is currently in the process of adjusting the district's boundary to include these two wells. For the purpose of this analysis, the two wells are treated as if they are already located within an entitlement holder's service area. The well inventory identified 44 irrigation river pumps. Like irrigation wells, each river pump used for irrigation is assumed to pump 476 acre-feet of water per year. The well inventory data set does not specify whether or not river pumps are located inside of or outside of a service area.

California – The USGS inventoried 78 irrigation wells in California. The USGS identified 30 wells outside of entitlement holder service area boundaries that are assumed to pump 14,280 acre-feet of water per year. Twenty-five river pumps were identified and are assumed to use 11,900 acre-feet of water per year.

<sup>20</sup> Includes all non-agricultural water uses consistent with USGS definition of domestic use.

<sup>21</sup> Dewatering wells identified in the well inventory as "Other" by the USGS have been excluded in this analysis.

Nevada - The lone irrigation well surveyed in Nevada is assumed to pump 476 acre-feet of irrigation water per year. No river pumps were inventoried by the USGS in Nevada. Table 3 summarizes the number of irrigation wells and their associated water use.

**Table 3: Estimated Irrigation Water Use by State in Acre-Feet Per Year (AFY)**

	Arizona	California	Nevada	Total
<b>Total Estimated Irrigation Water Use</b>				
Number of Wells	238	78	1	317
<b>Estimated Irrigation Use Outside Irrigation District Boundaries</b>				
Number of Wells	0	30	0	30
Total Water Use (AFY)	0	14,280	0	14,280
<b>River Pumps Estimated Irrigation Use</b>				
Number of River Pumps	44	25	0	69
Total Water Use (AFY)	20,944	11,900	0	32,844

**Estimated Amount Pumped per Well or River Pump = 476 Acre-Feet per Year**

Source: Bureau of Reclamation, 2007

#### Domestic Wells, River Pumps -- Annual Water Use Assumptions

Total domestic water use was estimated by adding several categories of water use together. The water use by individual wells for stock supply, residential, mining, institutional, fire protection, air conditioning, and recreation wells is assumed to be equal to 0.29 acre-feet per year for all uses.

#### Estimated Domestic Water Use

Arizona - The USGS identified 1,157 wells under the Domestic Use category (excluding public supply, commercial, and industrial wells). Ninety-seven domestic wells which were inventoried outside any entitlement holder service area boundaries pumped an estimated 28.13 acre-feet of water per year assuming an average of 0.29 acre-feet per year of water pumped per well. In Arizona, 69 river pumps were identified to be serving a domestic use. Colorado River water diverted by the river pumps for domestic use is estimated to be 20 acre-feet per year.

California - The USGS identified 1,088 domestic use wells (excluding public supply, commercial, and industrial wells). Of these, 65 domestic use wells were outside of any entitlement holder service area boundaries and are assumed to have pumped 18.85 acre-feet of water. The USGS identified 122 river pumps serving a domestic purpose in California; estimated use for these pumps is 35.38 acre-feet per year.

Nevada - The USGS inventoried no domestic use wells or river pumps. Table 4 summarizes the estimated domestic water use for the three states.

**Table 4: Estimated Domestic Water Use by State (AFY)**

Well Type	Arizona	California	Nevada	Total
<b>Total Estimated Domestic Wells</b>				
Stock Supply	17	4	0	21
Residential	1,117	1,070	0	2,187
Institutional	7	7	0	14
Fire Protection	3	4	0	7
Air Conditioning	3	0	0	3
Recreation	2	0	0	2
Mining	8	3	0	11
Total Wells	1,157	1,088	0	2,245
<b>Estimated Domestic Water Use Outside Service Areas (Wells)</b>				
Stock Supply	2	0	0	2
Residential	92	58	0	150
Institutional	0	5	0	5
Fire Protection	0	0	0	0
Air Conditioning	0	0	0	0
Recreation	1	0	0	1
Mining	2	2	0	4
Sub-Total Wells	97	65	0	162
Total Water Use (AFY)	28.13	18.85	0	46.98
<b>Estimated Use by River Pumps</b>				
Number of Pumps	69	122	0	191
Total Water Use (AFY)	20	35.38	0	55.38

**Estimated Amount Pumped per Well or River Pump = 0.29 Acre-Feet per Year**

Source: Bureau of Reclamation, 2007

### Estimated Industrial and Commercial Water Use

Industrial and commercial wells are assumed to pump two acre-feet per well per year. Arizona - The USGS inventoried 24 industrial wells and 41 commercial wells. One commercial well and four industrial wells are located outside of entitlement holder service areas; they pumped an estimated 10 acre-feet of water per year. No river pumps serving industrial or commercial purposes were identified by the USGS.

California - The USGS inventoried 29 industrial wells and 21 commercial wells in California. One industrial well is outside of any entitlement holder service area and it is assumed to have pumped two acre-feet of water per year. No river pumps serving industrial or commercial purposes were identified by the USGS.

Nevada - No Nevada industrial or commercial wells were identified by the USGS. No river pumps serving industrial or commercial purposes were identified. Table 5 summarizes the industrial/commercial water use.

**Table 5: Estimated Industrial and Commercial Water Use by State**

Well Type	Arizona	California	Nevada	Total
<b>Total Estimated Industrial/Commercial Water Use (Wells)</b>				
Commercial Wells	41	21	0	62
Industrial Wells	24	29	0	53
Total Wells	65	50	0	115
<b>Industrial/Commercial Use Outside Service Areas (Wells)</b>				
Commercial Wells	1	0	0	1
Industrial Wells	4	1	0	5
Sub-Total Wells	5	1	0	6
Total Water Use (AFY)	10	2	0	12
<b>River Pumps</b>				
Number of River Pumps	0	0	0	0

**Estimated Amount Pumped Per Well or River Pump = 2.0 Acre-Feet per Year**

Source: Bureau of Reclamation, 2007

### Estimated Public Supply Water Use

Arizona - Public supply wells were assumed to serve 10 households at a rate of 2.9 acre-feet per well per year. The USGS inventoried 139 public supply wells in Arizona. Of the total, seven wells were outside of service area boundaries and pumped an estimated 20.3 acre-feet of water per year. No river pumps serving a public supply purpose were identified by the USGS.

California - The USGS inventoried 101 public supply wells in California. Fourteen of these were outside service area boundaries; they pumped an estimated 40.6 acre-feet of water per year. No river pumps serving a public supply purpose were identified by the USGS.

Nevada - The USGS inventoried five public supply wells in Nevada. These wells pumped an estimated 14.5 acre-feet of water per year. All of these wells are located within entitlement holder service area boundaries. No river pumps serving a public supply purpose were identified by the USGS.

**Table 6: Estimated Public Supply Well and River Pump Water Use by State (AFY)**

<b>Well Type</b>	<b>Arizona</b>	<b>California</b>	<b>Nevada</b>	<b>Total</b>
Public Supply Wells	139	101	5	245
Public Supply Wells Outside Service Boundaries	7	14	0	21
Total Water Use (AFY)	20.3	40.6	0	60.9
Number of River Pumps	0	0	0	0

**Estimated Amount Pumped Per Well or River Pump = 2.9 Acre-Feet per Year**

Source: Bureau of Reclamation, 2007

### Other Wells

In the USGS well inventory, the term “Other Wells” includes both wells that could not be classed with any other wells in the inventory and wells that are used for dewatering purposes. Other wells, excluding dewatering wells, are assumed to pump one acre-foot of water per well per year. Dewatering wells are excluded from this analysis because they do not need an entitlement so long as the water is not put to a consumptive use (used for water supply purposes). No river pumps serving other purposes were identified by the USGS.

**Table 7: Other Wells Estimated Water Use by State**

<b>Well Type</b>	<b>Arizona</b>	<b>California</b>	<b>Nevada</b>	<b>Total</b>
<b>Total Estimated Water Use by State</b>				
Other Wells	8	2	0	10
<b>Outside Service Boundaries</b>				
Other Wells	2	0	0	2
Total Water Use (AFY)	2	0	0	2
<b>River Pumps</b>				
Number of River Pumps	0	0	0	0

**Estimated Amount Pumped Per Well or River Pump = 1.0 Acre-Feet per Year**

Source: Bureau of Reclamation, 2007

### Unclassified Wells or Unused Wells

The last category of wells included by the USGS in the well inventory is “Unclassified or Unused Wells.” The unused wells were observed without a pump or they were capped at

the time they were inventoried. While these wells may be operated in the future, Reclamation cannot ascertain what the potential future use from these wells will be. Currently, the unclassified wells may or may not be pumping water. The number of wells for these categories is included for informational purposes. One river pump in Arizona was identified by the USGS as unused. No river pumps were identified as unclassified.

**Table 8: Unclassified or Unused Wells and River Pumps by State (AFY)**

<b>Well Type</b>	<b>Arizona</b>	<b>California</b>	<b>Nevada</b>	<b>Total</b>
<b>Total Unclassified or Unused Wells Water Use</b>				
Unclassified Wells	17	4	5	26
Unused Wells	20	7	0	27
Total Wells	37	11	5	53
<b>Unclassified or Unused Wells Water Use Outside Service Boundaries</b>				
Unclassified Wells	1	1	0	2
Unused Wells	1	4	0	5
Sub-Total Wells	2	5	0	7
Water Use (AFY)	N/A	N/A	0	N/A
<b>Unclassified or Unused River Pumps</b>				
Unclassified River Pumps	0	0	0	0
Unused River Pumps	1	0		1
<b>Estimated Amount Pumped Per Well or River Pump = Unknown</b>				

Source: Bureau of Reclamation, 2007

## **Potential Compliance Costs Borne by Affected Parties**

Potential costs to be borne by parties affected by this rule may be generally categorized as Institutional Costs, costs borne by an individual, and Federal Costs. Institutional Costs are assumed to be incurred by a local government entity in response to the rule. Costs borne by an individual are simply the implicit and explicit costs of time for individuals to comply with the proposed regulation. Federal Costs are those costs incurred relative to this action by Federal agencies.

### Institutional Costs

Examples of Institutional Costs that may arise in response to the rule include charges levied by a lower Colorado River water entitlement holder such as a water district on individuals who become customers of the entitlement holder. These individuals become customers of the entitlement holder because their wells or river pumps are located within the place of use under the entitlement holder's entitlement although they may not receive

any water service from the entitlement holder. Individuals pumping lower Colorado River water from wells or river pumps who become a customer of an entitlement holder may be subject to the entitlement holder's fees.

#### Water District Assessed Cost Information

For this benefit-cost analysis, an informal survey of 12 irrigation districts and municipal water districts within the Lower Colorado Region was conducted (Attachment 4). In this survey we asked water districts whether or not they charge fees to landowners who pump lower Colorado River water through wells or river pumps within their service area boundaries but do not take deliveries of lower Colorado River water from the district. In general, districts have the capability to add landowners as customers and to report the new customers' use of lower Colorado River water under the district entitlement. Additional charges for adding landowners into the district vary widely among the districts; some would add landowners without additional charges, others would charge an inclusion fee.

#### *Domestic (Residential) Water Costs for Selected Service Areas*

Arizona - For residential water use in Arizona, we generally found an established rate. The Mohave Valley Irrigation and Drainage District (MVIDD) in Arizona indicated that existing residential customers pay \$1.35 per 1,000 gallons. MVIDD indicated it would not charge an inclusion fee for a new user to become a customer. MVIDD has the capability to include new residential users within its lower Colorado River water entitlement.

The City of Bullhead City, Arizona has a residential water charge of \$0.1398 per 1,000 gallons pumped from wells that produce more than 20 gallons per minute (gpm). Users with wells that pump less than 20 gpm are not charged for their pumped residential water. No annual fee is charged.

California - The Imperial Irrigation District (IID) has a tiered pricing structure for residential water users. Water users with less than five acres do not pay a fee to IID for water pumped from their own well (no surface water delivery from IID). Users with five or more acres pay \$4 per acre whether or not a surface water delivery is made by IID. IID does not charge a fee for inclusion into its district boundary or service area. IID has the capability to include more residential users within its lower Colorado River water entitlement. Information about IID residential water rates is included for informational purposes because a small portion of the IID district boundary lies within the accounting surface identified by Reclamation.

The costs for California residential rates used in this analysis are the rates used by the Palo Verde Irrigation District (PVID). The tax assessment rate and water toll information from the PVID website ([www.pvid.org](http://www.pvid.org)) was obtained and used. The tax assessment rate for Mesa lands included in the PVID service area is \$1.10 per \$100 of assessed value (\$0.40 for land and \$0.70 for improvements); an assessed value of \$1,000 per acre was

assumed. Additionally, there is an annual fee of \$52 per water toll acre for water. PVID will deliver up to five acre-feet of water per acre once the fees have been paid. Thus, a total fee of \$63 per acre is assessed. When the \$63 per acre is converted from a per acre basis into a per thousand gallons basis, the district charges an average of \$0.0387 per 1,000 gallons.

Some entities are located far from an entitlement holder service area or district boundary. In these cases, changing the boundary may not be a viable option. In California, individuals using lower Colorado River water without an entitlement for domestic use may enter a subcontract with the City of Needles, California under the LCWSP. The City of Needles, which acts as the Secretary's agent for the LCWSP, charges its subcontractors the following fees: a) A one-time application fee of \$408.24. This fee will be adjusted upward annually by 5.54 percent; b) Each subcontractor is charged an annual administrative fee of \$21.01 per acre-foot under subcontract. The City of Needles may adjust the administrative fees as necessary to cover its administrative costs; c) In any year where a LCWSP subcontractor orders water under the project, the City of Needles will assess such subcontractors a fee for operation and maintenance. Currently this fee is \$28.14 per acre-foot ordered by the subcontractor. This fee may also be adjusted as necessary.

Nevada – In Nevada, the USGS inventory did not identify any wells serving domestic uses. For informational purposes, domestic water assessments by the Big Bend Water District are included. Domestic customers pay a one-time activation fee of \$45, a monthly fee of \$7.10, \$2.70 per 1,000 gallons for the first 15,000 gallons used, and \$3.38 per 1,000 gallons in excess of the first 15,000 gallons used.

#### *Key Assumptions for Domestic (Residential) Water Use Compliance Cost Estimates*

Many Colorado River water entitlement holders account for domestic water use from wells and river pumps located within their service areas within their Colorado River water entitlement. However, for the purpose of this analysis, we assume that annual Colorado River water use is not accounted for from 10 percent of the domestic wells and river pumps located within entitlement holder service areas in Arizona and California. Therefore, we assume that the owners of 10 percent of the domestic wells and river pumps included in the well inventory will become obligated to pay annual district assessments, as appropriate, that they do not pay prior to promulgation of this rule. Annual district assessments are estimated in this analysis for domestic wells located outside of entitlement holder service areas. We assume that the use from these wells will be included within an entitlement after promulgation of the rule and that the well owners will pay annual district assessments which they do not pay prior to promulgation of this rule. For Arizona and California, an estimated low-end cost and high-end cost are shown in Table 9.

In Arizona, the low-end price is based on the Bullhead City cost structure. The high-end is based on the MVIDD cost structure for domestic water users. In California, the low-end relates to the PVID cost structure and the high-end is based on the City of Needles'

costs. When several cost structures were obtained from the telephone survey for a particular state, this analysis used the lowest priced water cost structure and the highest priced water cost structure to show a potential range of costs in each state.

#### *Key Assumptions Water Costs for Industrial, Commercial, Public Supply, and Other Uses*

Estimating the relevant costs for industrial, commercial, public supply and other wells is difficult because the water pumped from these wells is not generally classed as residential. However, these wells are pumping lower Colorado River water; the amount of water that they use and the associated costs under the rule must be evaluated. Therefore, the number of wells and the estimated amount of water used by industrial, commercial, public supply and other wells is converted into a per thousand gallon basis. The costs paid by these owners are assumed to be the same per thousand gallons as for residential rates. The residential rates are used for these wells because no information about existing fee structures or how these wells are categorized by irrigation districts or municipalities is available. For this analysis, we assume that annual Colorado River water use from wells under these four use categories that are located within service areas in Arizona, California, and Nevada is reported. Therefore, no incremental annual district assessments are attributed to industrial, commercial, public supply, and other wells in service areas. In this analysis, wells located outside of service areas are assumed to pay annual district assessments after promulgation of this rule because we assume that the water use from these wells will be reported under an entitlement.

#### Annual Water Costs for Non-Agricultural Well Owners

Arizona - The USGS inventoried 1,157 domestic use wells and 69 river pumps (excluding wells serving public supply, commercial, and industrial uses). Inventory data show that 97 wells are outside any service area (1,060 wells are located within service areas). For estimation of costs incremental to the rule for wells within service areas, we assume that 106 wells (30.74 AFY) and seven river pumps (2.03 AFY) are not accounting for water use and paying district assessments. Current use from all 97 wells (28.13 AFY) outside of a service area is assumed to be uncounted and district charges are assumed to not be assessed from these wells. The inventory data include one commercial well using an estimated two acre-feet of water per year (AFY), 4 industrial wells (8 AFY), 7 public supply wells (20.3 AFY), and two other wells (2 AFY) located outside of service areas. Well owners in Arizona will pay between \$0.1398 per 1,000 gallons to a maximum of \$1.35 per 1,000 gallons after being included in a service area.

California - The USGS inventoried 1,088 domestic wells (1,023 wells within service areas and 65 wells outside of service areas) and 122 river pumps. To estimate annual district costs that are incremental to the rule, we assume that 103 domestic wells within service areas, 65 domestic wells outside service areas, and 13 river pumps do not report water use and are not currently paying district assessments. The wells pump an estimated 50.46 AFY and the river pumps divert 3.77 AFY. Additionally, the inventory includes 0 commercial wells, one industrial well (2 AFY), 14 public supply wells (40.6AFY), and 0 other wells located outside of service area boundaries. Our district survey data reflect

that the price charged for pumped water ranges from a low of \$0.0387 per 1,000 gallons within the PVID to a high of \$0.1508 per 1,000 gallons for the City of Needles (plus activation costs of \$386.81).

Nevada - The USGS inventoried zero domestic wells and five public supply wells in Nevada. The public supply wells are located within the Big Bend Water District or in the Lake Mead National Recreation Area. Therefore, no incremental annual district assessments are attributed to the public supply wells in Nevada. Table 9 shows a summary of the range of costs for domestic wells and river pumps. In Table 10, the estimated range of costs for commercial, industrial, public supply and other wells is presented.

**Table 9: Annual Estimated Domestic (Residential) Water Use Costs by State (Unlawful Use)<sup>22</sup>**

	<b># Wells or Pumps</b>	<b>\$/1,000 Gallons</b>	<b>1,000 Gallons</b>	<b>Total Annual Cost</b>
<b>Arizona Residential Water Costs</b>				
Low-End Price				
Domestic Wells	203	\$0.1398	19,182.79	\$2,682
River Pumps	7	\$0.1398	661.48	\$92
Low-End Total	210		19,844.27	\$2,774
High-End Price				
Domestic Wells	203	\$1.35	19,277.29	\$25,897
River Pumps	7	\$1.35	661.48	\$893
High-End Total	210		19,938.76	\$26,790
<b>California Residential Water Costs</b>				
Low-End Cost				
Domestic Wells	168	\$0.04	15,875.41	\$614
River Pumps	13	\$0.04	1,228.45	\$48
Low-End Total	181		17,013.87	\$662
High-End Cost				
Domestic Wells	168	\$0.15	15,875.41	\$2,394
River Pumps	13	\$0.15	1,228.45	\$185
High-End Total	181		17,103.87	\$2,579
<b>Nevada Residential Water Costs</b>				
Low-End Cost				
Domestic Wells	0	\$0	0	\$0
River Pumps	0	\$0	0	\$0
Low-End Total	0	\$0	0	\$0
High-End Cost				
Domestic Wells	0	\$0	0	\$0
River Pumps	0	\$0	0	\$0
High-End Total	0	\$0	0	\$0
<b>Total Residential Water Costs</b>				
Domestic Wells	371			
River Pumps	20			
Low-End Cost			36,948.13	\$3,436
High-End Cost			36,948.13	\$29,369

Source: Bureau of Reclamation, 2007

<sup>22</sup> We are uncertain that any charge would be assessed residential well or river pump owners. However, this study uses potential maximum charges to illustrate the highest cost scenarios.

**Table 10: Annual Estimated Water Costs by State for Commercial, Industrial, Public Supply and Other Wells for Unlawful Use**

	# Wells	\$/1,000 Gallons	1,000 Gallons	Total Cost
<b>Arizona Water Costs</b>				
Low-end Cost				
Commercial	1	\$0.1398	651.70	\$91
Industrial	4	\$0.1398	2,606.80	\$364
Public Supply	7	\$0.1398	6,614.76	\$925
Other	2	\$0.1398	651.70	\$91
Low-End Total	14		10,524.96	\$1,471
High-End Cost				
Commercial	1	\$1.35	651.70	\$880
Industrial	4	\$1.35	2,606.80	\$3,519
Public Supply	7	\$1.35	6,614.76	\$8,930
Other	2	\$1.35	651.70	\$880
High-End Total	14		10,524.96	\$14,209
<b>California Water Costs</b>				
Low-End Cost				
Commercial	0	\$0.04	0.00	\$0
Industrial	1	\$0.04	651.70	\$25
Public Supply	14	\$0.04	13,229.51	\$512
Other	0	\$0.04	0.00	\$0
Low-End Total	15		13,881.21	\$537
High-End Cost				
Commercial	0	\$0.15	0.00	\$0
Industrial	1	\$0.15	651.70	\$98
Public Supply	14	\$0.15	13,229.51	\$1,995
Other	0	\$0.15	0.00	\$0
High-End Total	15		13,881.21	\$2,093
<b>Nevada Water Costs</b>				
Low-End Cost				
Commercial	0	0	0.00	\$0
Industrial	0	0	0.00	\$0
Public Supply	0	0	0.00	\$0
Other	0	0	0.00	\$0
Low-End Total	0	0	0.00	\$0
High-End Cost				
Commercial	0	0	0.00	\$0
Industrial	0	0	0.00	\$0
Public Supply	0	0	0.00	\$0
Other	0	0	0.00	\$0
High-End Total	0	0	0.00	\$0

Source: Bureau of Reclamation, 2007

**Table 11: Total Annual Estimated Water Costs by State for Commercial, Industrial, Public Supply, and Other Wells for Unlawful Use**

<b>Well Type</b>	<b># Wells</b>	<b>1,000 Gallons</b>	<b>Total Cost</b>
Commercial	1	651.70	
Industrial	5	3,258.50	
Public Supply	21	19,844.27	
Other	2	651.70	
Estimated Water Use (1,000 gallons)		24,406.17	
Low-End Cost			\$2,009
High-End Cost			\$16,302

Source: Bureau of Reclamation, 2007

### Wells Outside of Service or Areas of Water District Boundaries

California - Within the State of California, independent regulatory commissions called Local Area Formation Commissions (LAFCOs) have been established to oversee jurisdictional changes. LAFCOs receive their powers from the state legislature. Irrigators lacking an entitlement to lower Colorado River water that are located in close proximity to an existing irrigation district boundary or service area could possibly be included into that district or its service area. Such annexation of entities or individuals into districts already entitled to lower Colorado River water will allow for a change in status from an unlawful use to use that is in compliance with an entitlement. Those unlawful users not located in immediate proximity to an existing district may be able to establish an out of agency service agreement with the closest water district. LAFCO approval is required for the establishment of out of agency service agreements.

To estimate fees charged by a LAFCO in those circumstances in which it is a viable option to annex an entity or individuals into an existing water district or develop an out of agency service agreement, the Riverside County LAFCO application packet was consulted and representative fees selected (Attachment 5). Where fees vary based upon the amount of acreage to be considered in the rezoning decision, we used the maximum fee level. Under the Riverside County LAFCO fee schedule, changing a service area boundary (extra-territorial service provisions) costs less than changing a district boundary (district annexation). For this study, extra-territorial service represents low-end LAFCO costs and district annexation represents the high-end LAFCO costs. These fees are assumed to be one-time fees. Representative fees include: a) District annexation or extra-territorial service for 200 acres or more; b) A State Board of Equalization fee for 2,001 acres or more; and c) A California Department of Fish and Game fee of \$1,800. Other fees may apply, but information to estimate them is unavailable. Thus, the estimates presented herein will constitute a least-cost estimate for LAFCO fees. An additional contingency fee equal to 15 percent of the sum of the listed LAFCO fees was included in this study to account for unexpected costs.

The USGS identified 30 irrigation wells in California outside of irrigation district boundaries. These wells are estimated to use 14,280 acre-feet of water, assuming a water use factor of 476 acre-feet per well per year. When irrigation wells are annexed into an irrigation district's boundary or service area, the irrigation district pays the LAFCO fees. This analysis assumes that the fees are pro-rated to a per well basis and then the costs are passed to the well owners. The owners of these wells would pay the following one-time fees; \$268.33 per well for district annexation fees or \$191.67 per well for extra-territorial service; \$116.67 per well for State Board of Equalization fee; \$60 per well for Department of Fish and Game Fees; and an additional contingency fee (15 percent of the sum of the listed LAFCO fees) of \$55.25 to \$66.75 per well. These fees range from \$423 to \$512 per well.<sup>23</sup> Table 12 shows the one-time cost breakdown for irrigation wells in California.

Arizona and Nevada – Arizona and Nevada do not have LAFCOs. In this analysis, we assume no state- or county-level costs for district boundary or service area changes. All river pumps are assumed to be located within service areas because they are located in the mainstream or on canals or drainage ditches.

#### Annual Costs for Irrigation Well Owners and Key Assumptions

In this analysis, all well owners of agricultural wells that are located within service areas are assumed to report water use and pay district assessments where applicable. Ten percent of agricultural river pumps and all wells located outside of service areas are assumed to pay one-time costs and annual district costs due to implementation of the rule.

After being incorporated into an irrigation district's boundary or service area, each well may be subject to annual fees charged by the irrigation district. For example, if the well owner's land is incorporated into IID but does not have water delivered by the IID, IID will not assess the well owner an annual water delivery fee. If a well owner's land is incorporated into the Bard Water District, a fee of \$63.50 per acre will be assessed to the well owner. By becoming a customer of the Bard Water District, the well owner will qualify for up to five acre-feet per acre per year of lower Colorado River water to be delivered, thus the annual water costs will be \$12.70 per acre-foot.<sup>24</sup> Table 13 shows estimated annual costs for irrigation wells and river pumps in California.

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<sup>23</sup> The extent to which compliance costs may cause unlawful Colorado River water users to cap their wells, turn off their river pumps, or continue using water unlawfully after implementation of the rule cannot be estimated in this analysis.

<sup>24</sup> Reclamation believes, based on anecdotal information, that the Bard Water District would be unlikely to charge these costs to well owners who did not take delivery of water. However, we are including these costs to reflect the highest cost scenario possible.

**Table 12: Estimated One-Time LAFCO Costs for California Irrigation Wells (Unlawful Use)**

<b>One-time LAFCO Costs</b>	<b>Estimated Per Well Fees</b>	<b>Number of Wells</b>	<b>Low-End Total</b>	<b>High-End Total</b>
District Annexation > 200 Acres Extra-territorial Service	\$268.33	30	\$0.00	\$8,050.00
Provisions > 200 Acres State Board of Equalization Fee	\$191.67	30	\$5,750.00	\$0.00
≥ 2,001 Acres	\$116.67	30	\$3,500.00	\$3,500.00
Fish and Game Fee	\$60.00	30	\$1,800.00	\$1,800.00
Contingency Fee (15%)	\$55.25 - \$66.75	30	\$1,657.50	\$2,002.50
<b>One-time Cost</b>	<b>\$423 - \$512</b>		<b>\$12,708</b>	<b>\$15,353</b>

Source: Bureau of Reclamation, 2007

**Table 13: Estimated Annual Costs for Irrigation Wells and River Pumps in California (Unlawful Use)**

		<b>\$/AF</b>	<b>Annual Total</b>
Number of Wells and Pumps	33		
Acre-Feet Pumped	15,708		
Low-End Cost (per AF)		\$0	\$0
High-End Cost (per AF)		\$12.70	\$199,492

Source: Bureau of Reclamation, 2007

California - The USGS inventoried 78 irrigation wells, 30 of which are outside service area boundaries, and 25 irrigation river pumps. This analysis assumes that the 30 wells will be assessed the LAFCO fees and then become subject to the annual irrigation district fees, if any. Three river pumps are assumed to be charged annual assessments.

Arizona - The USGS inventoried 238 wells. The well inventory identified 44 irrigation pumps in Arizona. We assume that water use from five of the river pumps is not reported and that five river pump owners will be subject to annual district fees following implementation of the rule. Table 14 shows the estimated annual costs for Arizona irrigation river pumps.

**Table 14: Estimated Annual Irrigation District Costs for Arizona River Pumps (Unlawful Use)**

		<b>\$/AF</b>	<b>Annual Total</b>
Number of Pumps	5		
Acre-Feet Pumped	2,380		
Low-End Cost (per AF)		\$6.00	\$14,280
High-End Cost (per AF)		\$15.40	\$36,652

Source: Bureau of Reclamation, 2007

In the Yuma Irrigation District (YID), each customer has a share of five acre-feet of Colorado River water per acre. The YID water assessment is \$30 per acre or \$6 per acre-foot. For the high-end cost, we use the Yuma County Water Users' Association (YCWUA) fee schedule. Like YID, YCWUA customers have a share of five acre-feet per acre of Colorado River water. YCWUA charges \$77 per acre or \$15.40 per acre-foot. YCWUA charges are estimated for the river pumps only.

Nevada - The USGS inventoried one irrigation well in Nevada. The well is located on the Fort Mojave Indian Reservation. We assume that the well owner will not be required to pay fees for water use from the well due to implementation of this rule because the use is lawful.

### Costs Borne By Individuals

Identifying and quantifying this category of costs in this analysis is difficult. This category excludes annual district assessments and one-time costs. Water users interested in complying with Federal law by becoming a customer of a lower Colorado River water entitlement holder may have to pay certain costs as discussed above. However, in addition to the any monetary expenses, well or river pump owners may expend effort to obtain information, make a decision, and implement the decision. Quantification of these costs is beyond the scope of this analysis. Costs borne by individuals will also be incurred when a well or river pump owner challenges Reclamation's determination that he or she is pumping lower Colorado River water without an entitlement. These individuals may incur monetary and other costs to hire legal counsel, hydrologists, or other experts to challenge the determination. The number of challenges which may be raised and the costs to individuals to raise the challenges are unknown.

### Federal Costs

Reclamation will incur ongoing administrative costs to monitor and address unlawful use of lower Colorado River water. Activities related to monitoring and addressing unlawful use of lower Colorado River water must be performed with or without promulgation of this rule for Reclamation to remain in compliance with Colorado River law. The Federal cost incurred to monitor and address unlawful use of lower Colorado River water will be incurred with or without the rule. Therefore, Federal costs are within the regulatory baseline.

For well or river pump owners who want their lands to be included to a lower Colorado River water entitlement holder's service area, Reclamation must review and approve the inclusion of lands. Reclamation's review and approval costs for inclusions or exclusions of lands from water district boundaries is approximately \$2,000. Reclamation's costs may or may not be passed on to the individual well or pump owner by the entitlement holder. If an entitlement holder requests Reclamation to review and approve a change in its service area boundary to include a well or river pump, Reclamation will charge approximately \$1,000. In Arizona, if a well or river pump owner desires to enter into an individual water delivery contract with the Secretary, Reclamation will charge \$4,000 to

develop, write, and execute the contract. Furthermore, an annual contract administration fee of approximately \$600 will be assessed on the new contract holder by Reclamation. Arizona well or river pump owners who desire to enter into a water delivery contract with the Secretary through the Arizona Department of Water Resources may not be charged the contract development fee and the annual administration fee.

The well inventory identified 30 irrigation wells outside of service area boundaries in California. Most of the 30 irrigation wells are located near two irrigation districts who are lawful entitlement holders. The well owners may pay Reclamation for review and approval of an inclusion or service area change cost. For this study, we assume that Reclamation would review the request for inclusion or change of service area boundary by covering all of the wells at one time for the two districts (two separate actions; each action covers 15 wells). In Arizona, no irrigation wells are outside of service area boundaries.

The one-time costs are assumed to occur in year one of the analysis, thus the net present value of the one-time cost is equal to the nominal amount. If the one-time cost were to occur in any year other than year one, it would be discounted back to the present. Table 15 shows the expected one-time non-Federal and Federal costs and their net present values.

**Table 15: One-Time Costs by Cost-Type (Unlawful Use)<sup>25</sup>**

<b>Cost-Type</b>	<b>State</b>	<b>Cost Per Well</b>	<b>Number of Wells</b>	<b>Total Cost</b>
LCWSP Application Fee	CA	\$408.24	80	\$32,659
LAFCO Fees Low-End Estimate	CA	\$423	30	\$12,690
LAFCO Fees High-End Estimate	CA	\$512	30	\$15,360
Reclamation Inclusion Cost (2X)	CA	\$133	30	\$4,000
Service Area Boundary Changes (2X)	CA	\$67	30	\$2,000

Source: Bureau of Reclamation, 2007

#### Annual Non-Agricultural Water Use Costs and their Net Present Value

In addition to the one-time costs that may be incurred, a series of annual costs may be incurred. Table 16 shows the estimated costs over time for domestic wells and river pumps. The net present value of the annual stream of costs is shown at the bottom of the table. In Table 16, as well as Tables 17 through 19, the future estimated costs are presented in real or base year, 2007, dollars without inflation. We do not have

<sup>25</sup> In Arizona, domestic, commercial, industrial, public supply, and other wells are assumed to comply with Federal law through a water delivery contract under the Arizona Department of Water Resources. The assumed water use from 97 domestic wells located outside of service areas is 28.13 acre-feet per year. The assumed water use of 13 wells spread over commercial, industrial, public supply, and other uses is 31.3 acre-feet per year. Entering a water delivery contract with the United States under Arizona Department of Water Resources would be the most cost effective way to attain legal compliance for these Colorado River water uses.

information about how real costs faced by water users will change over time and whether or not the change in real costs related to lawful Colorado River water use will be consistent with inflation over the period of analysis. Water quantities per 1,000 gallons associated with Table 16 costs: Arizona, 19,844.27; California, 17,103.87; and Nevada, 0 (zero). These water quantities were used to estimate annual domestic water costs in Table 9.

**Table 16: Estimated-Domestic Water Costs and Their Net Present Value (Unlawful Use)**

Year	Low-End Domestic Water Costs			High-End Domestic Water Costs		
	Arizona	California	Nevada	Arizona	California	Nevada
2008	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2009	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2010	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2011	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2012	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2013	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2014	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2015	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2016	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2017	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2018	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2019	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2020	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2021	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2022	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2023	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2024	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2025	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2026	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
2027	\$2,774	\$662	\$0	\$26,790	\$2,579	\$0
NPV @ 3%	\$41,274	\$9,848	\$0	\$398,564	\$38,373	\$0
NPV @ 7 %	\$29,390	\$7,012	\$0	\$283,811	\$27,325	\$0

Source: Bureau of Reclamation, 2007

Arizona – under a discount rate of three 3 percent, the net present value of costs ranged from \$41,274 to \$398,564. Under a discount rate of 7 percent, costs ranged from \$29,390 to \$283,811.

California - under a discount rate of 3 percent, the net present value of costs ranged from \$9,848 to \$38,373. Under a discount rate of 7 percent, the net present value of costs ranged from \$7,012 to \$27,325.

Nevada – Given a discount rate of 3 percent, the net present value is \$0. Given a discount rate of 7 percent, the net present value is \$0.

Annual costs for commercial, industrial, public supply, and other wells were also estimated on an annual basis and a net present value for the stream of costs was calculated. Table 17 presents the annual costs estimated for commercial, industrial,

public supply, and other wells. The net present value of the annual stream of costs is shown at the bottom of the table. Water quantities per 1,000 gallons associated with Table 17 costs: Arizona, 10,524.96; California, 13,881.21; and Nevada, 0 (zero). These water quantities were used to estimate annual costs in Tables 10 and 11.

**Table 17: Range of Annual Estimated Costs for Commercial, Industrial, Public Supply, and Other Wells and Their Net Present Value of the Stream of Costs**

Year	Commercial, Industrial, Public Supply, Other Water Costs					
	Low-End Cost Estimate			High-End Cost Estimate		
	Arizona	California	Nevada	Arizona	California	Nevada
2008	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2009	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2010	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2011	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2012	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2013	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2014	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2015	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2016	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2017	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2018	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2019	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2020	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2021	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2022	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2023	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2024	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2025	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2026	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
2027	\$1,471	\$537	\$0	\$14,209	\$2,093	\$0
NPV @ 3%	\$21,891	\$7,992	\$0	\$211,389	\$31,143	\$0
NPV @ 7%	\$15,588	\$5,691	\$0	\$150,527	\$22,176	\$0

Source: Bureau of Reclamation, 2007.

Arizona - The net present value of the estimated costs for commercial, industrial, public supply, and other wells ranges from \$21,891 to \$211,389 when a discount rate of 3 percent is used. Under a real rate of interest, the estimated costs range from \$15,588 to \$150,527.

California - has net present values for costs ranging from \$7,992 to \$31,143 under a discount rate of 3 percent and \$5,691 to \$22,176 under a discount rate of 7 percent.

Nevada - Net present values are \$0 under the 3 percent and 7 percent discount rates because no annual costs are to be paid by public supply well owners due to implementation of the rule.

## Annual Irrigation Costs and Their Net Present Value

Annual irrigation costs were derived earlier in this analysis in Tables 13 and 14. In Table 18, the net present value of the annual irrigation costs was calculated. A range of values was only available for irrigation pumps in Arizona. The net present values are shown at the bottom of the table. Water quantities associated with Table 18: Arizona, 2,380 AFY; California, 15,708 AFY; and Nevada, 0 AFY.

**Table 18: Annual Estimated Cost and Net Present Value of Irrigation Costs by State**

Year	Low-End Irrigation Water Costs			High-End Irrigation Water Costs		
	Arizona	California	Nevada	Arizona	California	Nevada
2008	\$14,280	\$0	\$0	\$36,652	\$199,492	\$0
2009	\$14,280	\$0	\$0	\$37,752	\$205,476	\$0
2010	\$14,280	\$0	\$0	\$38,884	\$211,641	\$0
2011	\$14,280	\$0	\$0	\$40,051	\$217,990	\$0
2012	\$14,280	\$0	\$0	\$41,252	\$224,530	\$0
2013	\$14,280	\$0	\$0	\$42,490	\$231,265	\$0
2014	\$14,280	\$0	\$0	\$43,764	\$238,203	\$0
2015	\$14,280	\$0	\$0	\$45,077	\$245,350	\$0
2016	\$14,280	\$0	\$0	\$46,430	\$252,710	\$0
2017	\$14,280	\$0	\$0	\$47,823	\$260,291	\$0
2018	\$14,280	\$0	\$0	\$49,257	\$268,100	\$0
2019	\$14,280	\$0	\$0	\$50,735	\$276,143	\$0
2020	\$14,280	\$0	\$0	\$52,257	\$284,427	\$0
2021	\$14,280	\$0	\$0	\$53,825	\$292,960	\$0
2022	\$14,280	\$0	\$0	\$55,439	\$301,749	\$0
2023	\$14,280	\$0	\$0	\$57,103	\$310,801	\$0
2024	\$14,280	\$0	\$0	\$58,816	\$320,125	\$0
2025	\$14,280	\$0	\$0	\$60,580	\$329,729	\$0
2026	\$14,280	\$0	\$0	\$62,398	\$339,621	\$0
2027	\$14,280	\$0	\$0	\$64,270	\$349,810	\$0
NPV @ 3%	\$212,450	\$0	\$0	\$711,689	\$3,873,623	\$0
NPV @ 7%	\$151,283	\$0	\$0	\$488,632	\$2,659,555	\$0

Source: Bureau of Reclamation, 2007.

Arizona - Under a discount rate of 3 percent, the estimated low-end net present value for irrigation district costs are \$212,450. The estimated high-end net present value is \$711,689. Under a discount rate of 7 percent, the low-end net present value of irrigation district costs is estimated to be \$151,283; the high-end estimated net present value is \$488,632.

California – The low-end net present values for irrigation district costs are \$0 under discount rates of 3 percent and 7 percent. The net present value of high-end annual irrigation district assessments are \$3,873,623 under a 3 percent discount rate and \$2,659,555 under a 7 percent discount rate.

Nevada - The costs for the irrigation well on the Fort Mojave Indian Reservation are assumed to be \$0.

## Summary of Total Costs

The costs identified above in Tables 15 to 18 are summarized in Table 19. For water use quantities inherent in Table 19, refer to Table 16, domestic (residential) water use; Table 17, commercial, industrial, public supply, and other; and Table 18, agriculture.

**Table 19: Estimated Net Present Value of Total Costs Associated with the Proposed Rule**

	Discount Rate = 3%		Discount Rate = 7%	
	Low-End	High-End	Low-End	High-End
<b>One-Time Costs</b>				
LCWSP <sup>26</sup>	\$32,659	\$90,977	\$32,659	\$90,977
LAFCO	\$12,690	\$15,360	\$12,690	\$15,360
Reclamation	\$2,000	\$4,000	\$2,000	\$4,000
<b>Annual Costs</b>				
Domestic				
Arizona	\$41,274	\$398,564	\$29,390	\$283,811
California	\$9,848	\$38,373	\$7,012	\$27,325
Nevada	\$0	\$0	\$0	\$0
<b>Annual Costs</b>				
Comm, Indus, Public Sup, Other				
Arizona	\$21,891	\$211,389	\$15,588	\$150,527
California	\$7,992	\$31,143	\$5,691	\$22,176
Nevada	\$0	\$0	\$0	\$0
<b>Irrigation Costs</b>				
Arizona	\$212,450	\$711,689	\$151,283	\$488,632
California	\$0	\$3,873,623	\$0	\$2,659,555
Nevada	\$0	\$0	\$0	\$0
<b>Grand Total</b>	<b>\$340,804</b>	<b>\$5,375,118</b>	<b>\$256,313</b>	<b>\$3,742,363</b>

Source: Bureau of Reclamation, 2007

In Table 19, we see that the net present value of total costs attributable to rule implementation, range from \$340,804 to \$5,375,118 at the social discount rate of 3 percent and \$256,313 to \$3,742,363 at 7 percent given variation in annual water costs. To provide the reader with a cost estimate on a basis that is more familiar, the ranges of estimated costs in Table 19 will be divided by the estimated amounts of Colorado River water that is unlawfully pumped from the Colorado River aquifer on an annual basis in the section below. Table 20 reflects operational wells and river pumps from the well inventory for which the type of use is classified.

<sup>26</sup> The low-end cost for the LCWSP in Table 16 equals the 2008 application fee of \$408.24 x 80 non-agricultural wells outside of service areas in California. The high-end cost is the application fee in 2027, of \$1,137.21, assuming the annual cost increase is 5.54 percent, times 80 wells. We do not know how many individuals or entities will desire to enter LCWSP sub-contracts in 2027. For the high-end cost, we used the same number of wells (80) which are outside of service areas in 2008.

**Table 20: Operational and Classified Wells and River Pumps Inventoried**

	Arizona	California	Nevada	Total
Irrigation wells	238	78	1	317
Irrigation pumps	44	25	0	69
Domestic wells	1,157	1,088	0	2,245
Domestic pumps	69	122	0	191
Commercial wells	41	21	0	62
Industrial wells	24	29	0	53
Public supply wells	139	101	5	245
Other wells	8	2	0	10
<b>Total wells and pumps</b>	<b>1,720</b>	<b>1,466</b>	<b>6</b>	<b>3,192</b>

Source: Bureau of Reclamation, 2007

Summing across all operational and classified wells and river pumps which were inventoried by the USGS totals 3,192 wells and river pumps in the three states. The USGS continues to inventory wells and river pumps in the Colorado River aquifer.

In Table 21, the number of wells and river pumps utilized in the cost analysis are presented by state, location regarding service area (SA in the table), and type of water use. All river pumps are assumed to be located within service areas. For agricultural use, 10 percent of river pumps located within service areas and all wells outside of service areas were assumed to incur compliance costs under the rule. For domestic use, 10 percent of the wells and river pumps inventoried within a service area and all wells outside of a service area are assumed to incur compliance costs under the rule. For commercial, industrial, public supply and other water uses, only wells located outside of service areas are assumed to incur compliance costs under the rule. Using the estimated water use amounts shown below Table 21, the total estimated water use for wells and river pumps inside and outside of service areas that are assumed to incur compliance costs under the rule is 18,276 AFY. This estimate is higher than the range of unlawful water use estimated by Reclamation to be occurring. The analysis may overestimate cost for unlawful users to become compliant. The estimated water use for wells located outside of service areas (use from wells or pumps within service areas excluded) is 14,402 AFY in Table 21. From current data, Reclamation estimates that water lost due to

the use of Colorado River water in the Lower Basin without an entitlement outside of existing lower Colorado River water delivery service areas ranges between 9,000 AFY to 15,000 AFY. Reclamation does not know the extent of unlawful use within service areas.

**Table 21: Wells and River Pumps Included in the Cost Analysis and Related Estimated Water Use**

	Arizona	California	Nevada	Total
Irrigation Wells (Outside SA)	0	30	0	30
Irrigation Pumps (10%)	5	3	0	8
<i>Estimated Water Use (AFY)</i>	2,380	15,708	0	18,088
<b><i>Estimated Water Use Outside SA (AFY)</i><sup>27</sup></b>				<b>14,280</b>
Domestic Wells				
Inside Service Area (10%)	106	103	0	209
Outside Service Area	97	65	0	162
Domestic Pumps (10%)	7	13	0	20
<i>Estimated Water Use (AFY)</i>	60.9	52.49	0	113.39
<i>Estimated Water Use Outside SA (AFY)</i>				46.98
Commercial Wells	1	0	0	1
<i>Estimated Water Use (AFY)</i>	2	0	0	2
Industrial Wells	4	1	0	5
<i>Estimated Water Use (AFY)</i>	8	2	0	10
Public Supply Wells	7	14	0	21
<i>Estimated Water Use (AFY)</i>	20.3	40.6	0	60.9
Other Wells	2	0	0	2
<i>Estimated Water Use (AFY)</i>	2	0	0	2
Total Wells and Pumps	229.00	229.00	0.00	458.00
<b><i>Estimated Water Use (AFY)</i></b>	<b>2,473</b>	<b>15,803</b>	<b>0</b>	<b>18,276</b>
<b><i>Estimated Water Use Outside SA (AFY)</i></b>				<b>14,402</b>
Estimated Water Use (AFY)				
Irrigation	476.00			
Domestic (Residential)	0.29			
Industrial	2.00			
Commercial	2.00			
Public Supply	2.90			
Other	1.00			

Source: Bureau of Reclamation, 2007

<sup>27</sup> “Estimated Water Use Outside SA (AFY),” 14,402, is a subtotal of “Estimated Water Use (AFY),” 18,276.

Using the ranges of estimated grand total costs under the two interest rate scenarios from Table 19, we can estimate the total compliance costs under the rule on a per acre-foot basis.

**Table 22: Estimated Net Present Value Cost per Acre-Foot per Year**

	9,000 AFY	15,000 AFY
<b>Discount Rate 3%</b>		
Low-End Cost	\$37.87	\$22.72
High-End Cost	\$597.24	\$358.34
<b>Discount Rate 7%</b>		
Low-End Cost	\$28.48	\$17.09
High-End Cost	\$415.82	\$249.49

Source: Bureau of Reclamation, 2007

## Conclusion

The estimated compliance costs for unlawful uses to become lawful have been examined. The benefits of the rule are difficult to monetize. However, the benefits conferred by the rule accrue to the entire lower Colorado River Basin. The rule will:

- (a) Enable the public to review the river aquifer/accounting surface methodology which Reclamation will use to determine if a well pumps water that is replaced with water drawn from the lower Colorado River;
- (b) Identify the boundary of the lower Colorado River aquifer;
- (c) Inform unlawful users of options available to obtain compliance with Colorado River law;
- (d) Accord due process to water users who wish to challenge Reclamation's determination that a well pumps water that is replaced by water drawn from the lower Colorado River; and
- (e) Enable Reclamation to account for consumptive use of lower Colorado River water with more accuracy.

The rule will promote improved management of the resource which benefits current and future use.

## **SECTION IV**

# **REGULATORY FLEXIBILITY ANALYSIS**

# **Regulating the Use of Lower Colorado River Water Without an Entitlement**

## **43 CFR Part 415**

### **RIN 1006-AA50**

#### **Initial Regulatory Flexibility Analysis**

### **Introduction**

The Regulatory Flexibility Act of 1980 (P.L. 96-354), as amended, requires Federal government agencies to endeavor to fit regulatory and informational requirements to the scale of entities subject to the regulation. The Regulatory Flexibility Analysis enables Federal agencies to develop rules in a manner that minimizes impacts on small entities. A “small entity” is a small business, small organization, or a small government jurisdiction as defined by the Regulatory Flexibility Act of 1980, as amended.

### **Purpose of the Rule**

The rule provides a framework for identifying and curtailing the use of mainstream Colorado River water in the Lower Colorado River Basin without an entitlement. An entitlement authorizes a person or entity to take water from the lower Colorado River for beneficial use. An entitlement to take lower Colorado River water exists in one of three forms:

- (d) a decreed right as described in the Consolidated Decree entered by the United States Supreme Court in Arizona v. California, 547 U.S. 150 (2006) (Supreme Court Decree);
- (e) a water delivery contract with the Secretary of the Interior (Secretary); or
- (f) a Secretarial Reservation of lower Colorado River water.

Any diversion or consumptive use of lower Colorado River water without an entitlement is unlawful.

The rule will:

- (d) Establish the methodology to be used by the Bureau of Reclamation (Reclamation) to determine if a well pumps water that is replaced with water drawn from the lower Colorado River;
- (e) Establish the criteria a water user must satisfy to demonstrate that his or her well does not pump water that is replaced with water drawn from the lower Colorado River;
- (f) Establish a process for a water user to appeal a determination that a specific well pumps water that would be replaced by water from the lower Colorado River.

The rule will inform unlawful users about the existence of various options from which they may choose to bring their use of Colorado River water in the Lower Basin into compliance with Federal law.

### **Need for Action, Objectives, and Legal Basis of Proposed Rule**

Please refer to the Policy Rationale section of the Benefit-Cost Analysis/Unfunded Mandates Reform Act Analysis (BCA/UMRA Analysis).

### **Threshold: Significant or Unique Impacts on Small Entities**

The BCA/UMRA Analysis reflects that the proposed rule does not impose significant or unique impacts upon small governments (including Native American communities), small entities such as water purveyors or associations, or individual water entitlement holders. The rule will not impose any record keeping, reporting, or compliance requirements associated with the use of lower Colorado River water that are not already imposed by the Boulder Canyon Project Act of 1928 and the Supreme Court Decree. Record keeping procedures associated with compilation and reporting of water use data required under Federal law are typically computerized. Individuals performing data compilation and reporting functions need basic skills associated with operating electronic spreadsheet and word processing programs.

Well and river pump owners who are currently using lower Colorado River water unlawfully will be provided information about the various options described in the rule which are available to bring their Colorado River water use into compliance with Federal law. To comply with Federal law, well and river pump owners may incur one-time and/or annual monetary costs depending upon the nature of the compliance (whether they secure their own entitlement or become a customer of an entitlement holder). Among entitlement holders such as water districts, policies vary regarding the assessment of fees on customers who do not receive surface water deliveries through district facilities. Additional one-time and/or annual costs may also be assessed by the Federal government and county governments. The source, nature, magnitude, incidence, and timing of compliance costs are described in Section III of the BCA/UMRA Analysis.

### **Quantification of Benefits Attained Under the Rule**

Although compliance with Federal law is not free from a personal and/or monetary cost perspective, compliance provides a benefit to individual water users. Lawful users of lower Colorado River water generally have the ability to use the water in perpetuity assuming the water is put to beneficial use and mainstream water supplies are available. Benefits to individual water users, water users at the regional level, and to the Colorado River system which will result from the rule are enumerated in Section III of the BCA/UMRA Analysis.

The benefits of the rule contribute to broad public aspects of the lower Colorado River and are impossible to quantify in the BCA/UMRA Analysis. Quantification of the benefit of the rule to the individual and in the aggregate could not be performed because benefits conferred by the rule are often associated with enforcement of laws which provide for the orderly distribution and utilization of Colorado River water supplies by entitlement holders. The value of Colorado River law is difficult to measure. Protection of lower Colorado River water entitlements and proper accounting of water use provide important individual, regional, and national benefits. Currently, the Colorado River supplies water for approximately 1.5 million acres of irrigated land and domestic supplies for more than 20 million people in the Lower Basin. The value of law may be determined if the following information were known: (1) the revealed preferences of residents in the Lower Colorado Region regarding Colorado River law, and (2) the individual values placed upon Colorado River law by those residents. Perhaps we could measure the value of law, as if law were a commodity, if the indifference functions for residents of the region relative to a wide range of preferences regarding law were known. Since law does not enter the market place and receive a value in dollars, the value of this action cannot be quantified within the scope of the benefit-cost analysis.

The inability to quantify identified benefits follows primarily from a lack of data. The unquantifiable benefits are enumerated below and are accompanied with discussion of proposed methodology which could be applied to estimate the monetary value of the benefits if data were available.

Benefits:

The Secretary can properly account for consumptive use of Colorado River water: The Secretary is required to account for all Colorado River water use. Water users have a vested interest in proper water use accounting. If water use accounting is performed improperly, or perceived as such, political pressure would be brought to bear on the Secretary. The cost of such effort cannot be estimated. In the extreme, litigation could be pursued against the Secretary, which would result in substantial costs for Federal and non-Federal parties. Previous actions may provide some indication of cost but since numerous scenarios could be identified and since no patterns have been established historically, little can be deduced from previous actions.

Identification of the boundary of the Colorado River aquifer and clarification of the hydrological conditions under which water is being drawn from the lower Colorado River: The rule identifies the boundary of the Colorado River aquifer and implements a method to identify wells that are pumping water that is replaced by water drawn from the lower Colorado River. Accurate identification of wells and river pumps that are withdrawing lower Colorado River water is necessary to account for consumptive use. Implementation of the rule will serve notice to all potential unlawful users of lower Colorado River water that they must comply with Federal law. Through the process established by the rule, the Secretary will determine the hydrologic status of the water use.

Clarification of the requirements of Colorado River law relative to use of lower Colorado River water: Clarification of Colorado River water use requirements is significant benefit associated with the rule because the requirements directly affect individual well and river pump owners. Quantification of the benefit would rely upon the value of education. How many water users are informed regarding Colorado River law? If the proportion of users who were informed were known, then knowledge of the effectiveness of education and what portion of those water users would then comply with Federal law on the Colorado River would be necessary. In addition, knowledge of the segment of the water users who would not, or do not, comply even though they are aware of the requirements would be necessary. If the number of users and associated water use were known, a value could be quantified for the acre-feet of water which might become lawfully used that is now unlawfully used.

The rule will contribute to the long-term sustainability of the lower Colorado River: For the lower Colorado River to support human life and drive regional and national economic activity indefinitely, regulation of use and strict water use accounting must be implemented to avoid advertent or inadvertent overuse of the lower Colorado River. Certain water users may consider the Colorado River an open access resource. The rule and the Law of the River provide oversight mechanisms for the purpose of restricting access to the resource.

The rule may improve Reclamation's ability to anticipate future water shortages: The rule regulates use to facilitate Reclamation's management of existing flow and stock characteristics of the lower Colorado River. Through implementation of this rule, Reclamation will become more informed about consumptive use of lower Colorado River water; therefore, Reclamation will be better equipped to manage lower Colorado River water supplies in a manner which reduces future risk and/or reduces uncertainty regarding future shortage in terms of magnitude and timing. Improved oversight of water use which will contribute to our understanding of the potential magnitude and frequency of future water shortages on the lower Colorado River is an important but unquantifiable benefit to the nation.

## **Overlapping Rules**

There are no duplicate or conflicting rules regarding the Colorado River.

## **Regulatory Alternatives**

No regulatory alternatives to this rule have been identified. The only alternative is not to promulgate this rule. Under that scenario, the following two items may not undergo formal Federal and public review:

- (a) The methodology to determine if a well pumps water that is replaced with water drawn from the lower Colorado River; and

- (b) The criteria that water user must satisfy to demonstrate that a well does not pump water that is replaced with water drawn from the lower Colorado River.

The rule is novel due to uncertainty regarding the manner in which the rule will be received by the public. Unlawful water users may not welcome perceived Federal government interference in their enjoyment of the use of a resource which flows underneath or adjacent to their property. Some land owners may believe that the proximity of the mainstream of the Colorado River or the Colorado River aquifer to their land gives them a right to use the water. The use of lower Colorado River water is subject to federally imposed conditions. Unlawful users of lower Colorado River water must attain an entitlement to use the water or use the water within the framework of an entitlement held by another individual or entity.

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